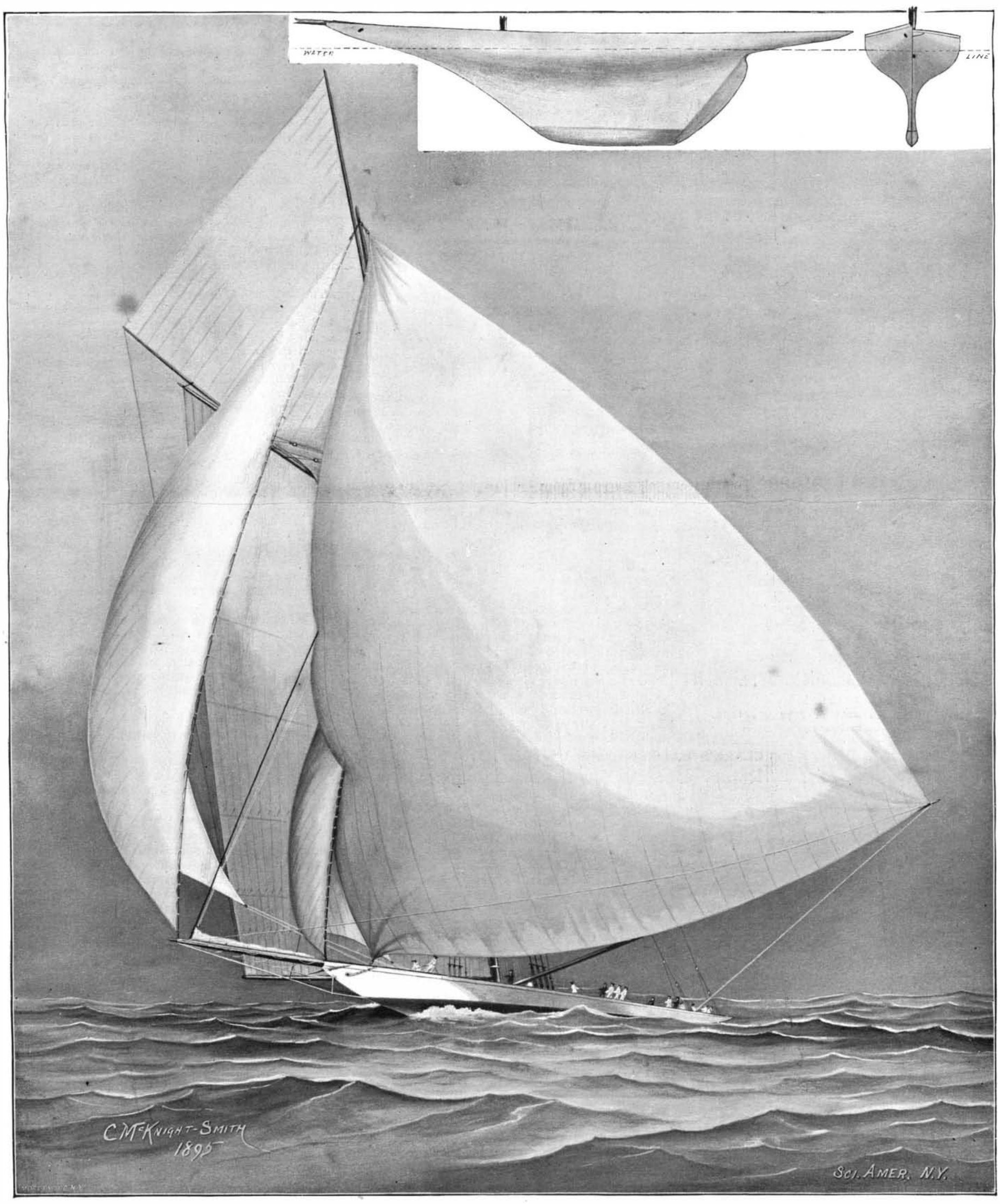
# SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1895, by Munn & Co.]

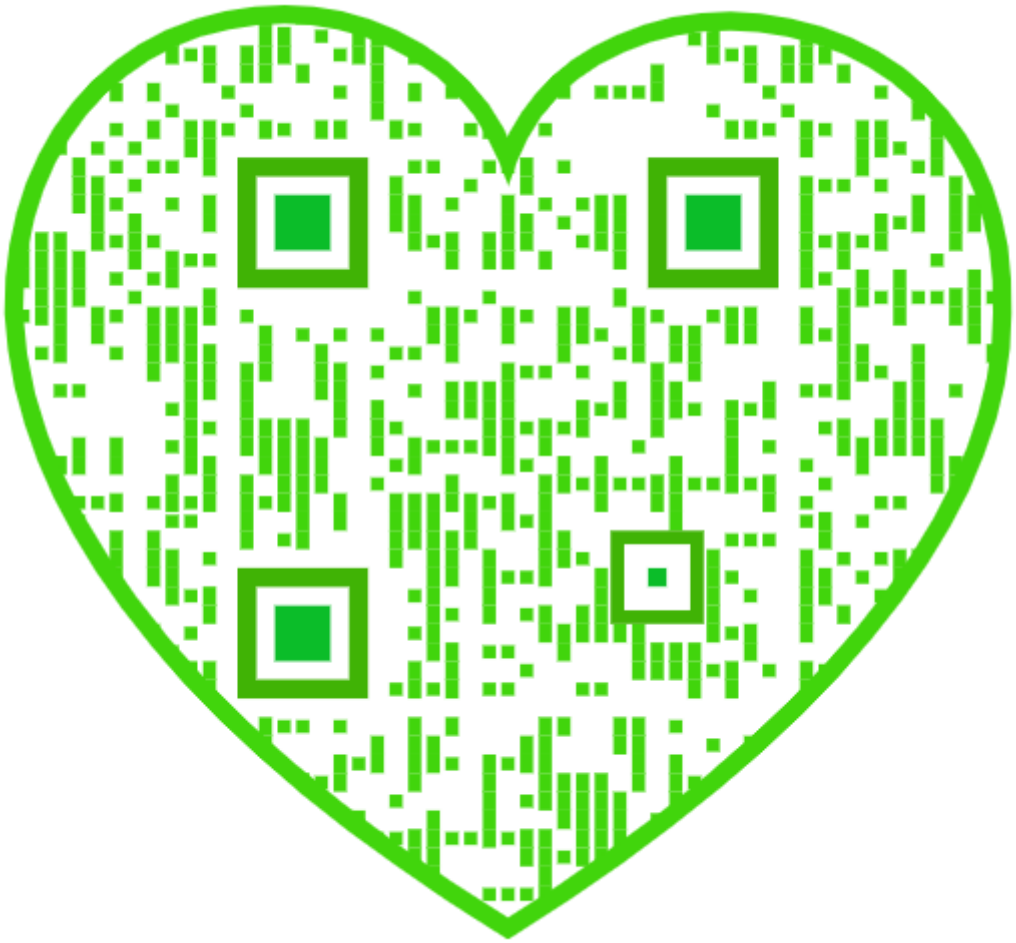
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXII.—No. 21. ESTABLISHED 1845. | NEW YORK, MAY 25, 1895 | $3.00 A YEAR. WEEKLY.


**THE NEW AMERICAN YACHT THE DEFENDER.**—[See page 327.]

© 1895 SCIENTIFIC AMERICAN, INC.



# Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

**TERMS FOR THE SCIENTIFIC AMERICAN.**

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

**The Scientific American Supplement**

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

**Combined Rates.**—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

**Building Edition of Scientific American.**

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

**Export Edition of the Scientific American,**

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 cents.

☞ Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost. MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, MAY 25, 1895.


**Contents.**

(Illustrated articles are marked with an asterisk.)


Animals, the courting of..... 327
Anthion for washing hypo from prints..... 323
Ants, agricultural..... 327
Bicycle, a new use for..... 325
Bilge keels..... 328
Bird, hammerkop, the dancing.. 327
Bleaching, electrolytical process of..... 323
Boat lowering devices needed... 331
Boiler sheets, temperature of (6532)..... 333
Car fender, Trinchard's*..... 326
Columbia College library..... 331
Commutators, repairing..... 326
Defender, the new yacht*..... 321
Drilling machine, a radial*..... 325
Electric lighting and heating .... 322
Electric railways, protecting pipes from*..... 331
Electric railways, suspended*.... 328
Elevated Railroad, Metropolitan, Chicago..... 322
Engineers, aliens as..... 325
Engine steam chests, eating away of (6534)..... 333
Faucet, Byrne's*..... 324
Gas burner, incandescent, the DeMare..... 330
Glass, stained, ancient and modern..... 326
Gold tests (6535)..... 333
Grape fruit as a tonic..... 325
Grass, sleepy..... 327
Heating drum, Johnson's*..... 324
Incandescent lamps, fires caused by..... 328
Inventions recently patented.... 332
Lake, a new Italian..... 326
Leather belt cement and dressing (6530)..... 332
Life line apparatus, Schmitt's*.. 325
Lightning, photographs of..... 330
Locomotive cabs, English..... 329
Newspaper, making a..... 324
Notes and queries..... 332
Oleander, the..... 325
Oxen and buffaloes, sporting*... 329
Patents granted, weekly record. 995
Photography, shop..... 330
Piano exercising device, Felden's*324
Pigeons, homing, keeping..... 326
Plants, co-operation in..... 327
Polishing cutlery (6528)..... 332
Railway systems, suspended*.... 328
Rayleigh, Lord, honors for..... 326
Saturn, spectroscopic observations of..... 323
Stream forms, solid..... 331
Stump puller, Wilson's*..... 331
Sunflower cake, meal of..... 322
Tire, elastic, Honrath's*..... 324
Toothpick industry, the..... 329
Wax in cotton and linen fiber .. 323
Webster, Daniel, on the great West..... 323


## TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 1012.

**For the Week Ending May 25, 1895.**

Price 10 cents. For sale by all newsdealers


PAGE

I. ARCHÆOLOGY.—The Latest Discoveries at Silchester.—Interesting remains of a Roman town in England.—Discoveries made on its site and the production of a map of its location of streets.. 16180

II. ASTRONOMY.—The Spectroscope in Astronomy.—By TAYLOR REED.—The spectra of stars and what they tell us.—The use of the physical instrument by the astronomer..... 16179

III. CHEMISTRY.—Acetylene.—A paper by a German chemist on the properties of acetylene and calcium carbide..... 16177
Chemical Industry at the Chicago Exhibition.—A German chemist's review of the exhibits in applied chemistry at the Columbian Exposition.—An interesting abstract of the most interesting displays..... 16175
On the Properties of Amorphous Silicon.—By M. VIGOUROUX.—Exhaustive examination of the properties of this hitherto unstudied substance..... 16177

IV. CIVIL ENGINEERING.—Sinking Shafts by the Freezing Process.—A triumph of the Poetsch freezing process in putting down a 21 foot shaft 330 feet deep through quicksand, requiring a six months freezing process..... 16167
The Split Tube System.—A new system of concrete and steel construction, split steel tubes being interlocked and filled with concrete.—3 illustrations..... 16172
To "Fall" a Chimney.—How a chimney was overturned in the exact locality desired by a "steeple jack."—1 illustration..... 16172

V. CYCLING.—Half a Century of Cycles.—An interesting historical article descriptive of the first and latest developments of the bicycle.—9 illustrations..... 16168

VI. DECORATIVE ART.—Suggestions for Corner Decorations.—Three examples of furnishing for corners of rooms.—3 illustrations..... 16175

VII. ENTOMOLOGY.—The San Jose Scale (Aspidiotus perniciosus, Comstock).—By Prof. C. V. RILEY.—The first installment of a treatise on this destructive insect.—5 illustrations..... 16178

VIII. GEOLOGY.—Sedimentary Measurement of Cretaceous Time.—The correlation of geologic strata with an astronomical cycle of known period, to obtain an estimate of the duration of geologic times..... 16180
The Age of the Earth.—The age of the earth examined and Lord Kelvin's conclusions thereon criticised..... 16181

IX. METALLURGY.—The Works of Charles Cammell & Company, Limited, Sheffield.—The great forging press of the Sheffield Steel Works for the production of ordnance and other heavy objects.—1 illustration..... 16167

X. MISCELLANEOUS.—Bell Ringers.—A very interesting and curious article, describing the method of ringing large bells as done in Europe.—3 illustrations..... 16174

XI. NAVAL ENGINEERING.—An Aluminum Torpedo Boat.—By A. F. YARROW.—Description of an aluminum torpedo boat built for the French government.—A scientific paper on the use of aluminum for vessels, including the consideration of its strength and its susceptibility to corrosion.—3 illustrations..... 16171

XII. ORNITHOLOGY.—The Great Auk.—A stuffed specimen of the rare bird recently offered at auction in London.—The failure to sell it..... 16179

XIII. PHYSICS.—The Cause of Luminosity in the Flames of Hydrocarbon Gases. By Prof. VIVIAN B. LEWES.—A careful examination into the physics of flame.—First installment..... 16176

XIV. TECHNOLOGY.—Manufacture of Rock Wall Plaster.—The manufacture of plaster containing hair and all desired ingredients, ready for application to the wall.—3 illustrations..... 16173
The Manufacture of Starch from Maize.—By J. KRIEGNER.—A useful abstract of the starch manufacturing process, including the saving of the glue and oil..... 16172
The Northrop Loom.—A wonderful advance in the manufacture of textile fabric, involving the automatic replacement of filling in the shuttle without stopping the loom.—4 illustrations..... 16170


## ELECTRIC LIGHTING AND HEATING.

The tendency of the education of the scientist and engineer is to develop in his mind a dislike for the waste of energy. One of the favorite aims of the steam engineer is to lower the pounds of coal burned per horse power hour. The greatest rivalry exists among the builders and designers of pumps—each one striving to produce a pumping engine of more efficiency or giving higher duty than his rivals. In this and similar races for simple fuel efficiency the question of capitalization is apt to be overlooked. Many an instance of a high duty machine might be found where the interest charges greatly overbalanced the fuel economy. A low duty machine is often the cheapest to run.

In electric heating, which is one of the latest developments of electricity, good instances of a similar condition of things can be found. Electricity has been successfully applied to the production of light, and its most inefficient role in this direction, and one involving the largest amount of copper in the conductors, has proved most acceptable to the public. The incandescent lamp, on account of its attractive appearance, its ease of installation, its steadiness and its healthfulness, as it does not contaminate the air, has proved a most serious competitor with gas. Yet the inefficiency of the comparatively low potential incandescent lamp is almost startling when compared with the economy of the arc lamp. There is something repugnant to the scientific economist in the idea of delivering electric energy with an initial potential of little over two hundred volts. But the public likes the incandescent lamp, admires it when mounted on beautiful electroliers, is willing to make it softer to the eyes by screening it with ground or cut glass and sees no enormity in wasting eighty or ninety per cent of it by the last named processes. The incandescent lamp has been accepted by the public, and the expenditure of a horse power for the maintenance at low white heat of a yard or two of fine carbon filament is good practice, if it is poor theory. The engineer makes an error if too theoretical—he must remember that he is catering to the affairs of practical everyday life, and fuel economy or pure efficiency may be absolutely unpopular. The human element must be taken into account.

Electric heating is now coming to the front, and for certain cases has become a possibility, because of the low economy which seems necessarily inherent in domestic processes. It has to compete with heat most wastefully applied; otherwise it would be out of the question, except as a matter of luxury. But when to the low economy of the kitchen fire, which is its competitor, there is added it own extreme convenience and cleanliness, it will be seen that a very good case is made out for the employment of the electric current.

The general aspect of the case is thus put by its advocates. In the electric station energy is generated with an efficiency of about six per cent. When this energy is applied in cooking operations great economy results, and but little of the six per cent is lost. Thus, if water is to be boiled, a heating coil in direct contact with the water will utilize nearly all the energy except that represented by the difference between the average temperature of the water and that of the air. In broiling or baking by the use of scientifically designed heaters, a very high percentage of the electric energy can be utilized. The low economy of the generation of the electric energy is compensated for in the comparative sense by the low economy of cooking with coal. To boil a kettle of water or to properly broil a few chops any quantity of fuel may be heaped upon a fire, and after the work is done the fuel may burn on for hours doing nothing. But the electric current is turned on only as wanted. The instant the cooking is accomplished it is turned off, and all expenditure ceases. It is calculated that a cooking fire may only utilize one or two per cent of the heat produced while cooking is going on. When the cooking ceases, all goes to waste.

Electric heating has to contend with one great obstacle—the low efficiency of the steam plant; and its utilization is only possible because of the waste of fuel in household operations.

In the field of heating the adaptability and simplicity of application of electricity may give it great success. The catalogues of the suppliers of electric heating apparatus are full of most suggestive suggestions. From a radiator for heating a room to an electric curling tongs all are figured. There is something wonderfully attractive in starting a stove by turning a switch. The stove may stand on a table, to be set aside when its work is done.

There are no products of combustion to be disposed of. A kettle can be boiled in a parlor without any flame or danger from alcohol explosion.

As regards heating on the large scale, as of rooms or entire houses, success is very doubtful. Ordinary heating apparatus may be made to give much higher efficiency than can be given by the regulation cooking stove, where, practically speaking, a scuttle of coal may be expended in cooking a few chops. A properly arranged furnace or heating apparatus can be made to give results far ahead of anything that electricity, with its 94 per cent handicap, can be expected to produce.

## Opening of the Metropolitan Elevated Railroad, Chicago.

The Metropolitan Elevated Railroad, the first electric elevated road in Chicago, was formally opened on April 17. The motor cars, which were built for the company by the Barney & Smith Car Company, of Dayton, Ohio, necessarily differ in many respects from those ordinarily used either on surface or elevated roads. The principal feature of the car is the steel sub-frame, which was added to enable the car to pull six loaded, forty-foot trailers, and also to get sufficient weight for traction; for the latter reason no attempt has been made to lighten the construction of the car body and trucks.

The car weighs nearly 40,000 pounds without electric apparatus of any kind. The body is 40 feet long, while the steel frame is 47 feet 3 inches. The entire height from rail to roof is 12 feet 10 inches, the width at the sill is 8 feet 7 inches, and that at the eaves is 8 feet 11 inches.

The end sills are of oak, and the six longitudinal sills and stringers are of long leaf yellow pine. The end frames have iron plates at the sill and uprights to prevent telescoping in case of collision.

There is a motorman's cab at each end, diagonally opposite each other, extending out on the platform as far as the end of the hood. The entrance doors are, therefore, next to the corner posts, and slide back into the cabs. As the front door is always to be kept fastened, this will not inconvenience the motorman.

The cars are handsomely finished within in quartered oak, and are lighted by incandescent lamps placed directly above the seats. Electric heaters will be used in the winter. They are also equipped with quick-acting air brakes, the air being carried in storage tanks under each car.

The first train to carry other persons than officials made its trip succesfully over the Metropolitan "L" road on the 17th ult. The northwest branch of the road is complete to Wicker Park, and to this point the special Pullman train was run. The run from Canal Street to Paulina Street was made in five minutes. There the main line of the road, which carries four tracks, ends, and the Garfield Park, Douglas Park and Logan Square lines begin. The Garfield Park line extends to Forty-eighth Street. The Douglas Park line extends from the terminal of the main line south to Twenty-first Street, and thence past Douglas Park to Central Avenue. This branch is not yet completed. The Logan Square line extends from the terminal of the main line north to Milwaukee Avenue and Division Street, and thence northwest, parallel with Milwaukee Avenue, to Logan Square. The Humboldt Park line branches off the Logan Square line at Robey Street and North Avenue, and will extend west to Crawford Avenue when completed. The Logan Square line penetrates one of the most densely populated districts of the west side and will draw its patronage largely from the Polish quarter.

These various lines contain miles of track as follows: Main line, 1·8 miles; Garfield Park line, 4·2 miles; Douglas Park line, 3·7 miles; Logan Square line, 4·49 miles; Humboldt Park line, 2·13 miles. The various lines contain forty-three stations.

The Metropolitan line will run 155 cars—100 passengers and 55 motors.

There are two impressive pieces of engineering—one the bridge on the Logan Square line, which carries the elevated tracks over the Northwestern Railway tracks and has a span of 250 feet. The method by which the Metropolitan tracks are carried over the Lake Street "L" tracks also presents an interesting feature of engineering.

## Meal of Sunflower Cake.

Sunflower cake has been found, especially in Russia, one of the best auxiliary cattle foods. As early as the year 1866 about 100,000 centners of sunflower oil (oil of the seeds of Helianthus annuus) were manufactured in Russia, and its amount has increased year by year, it being esteemed as a very palatable alimentary oil. The oil was formerly obtained by hydraulic means; the residual cake is harder than any other variety of oil cake, and for this reason apparently it has not found a wider application. Denmark and the northern countries import large quantities annually, as do also the eastern provinces of Germany, and the problem of its disintegration has been successfully solved by several manufacturers there. It is still unknown in Southern and Western Germany; now, however, that it is put on the market in the form of meal it will doubtless soon find general application, suited, as it is, both on account of its composition and pleasant taste, for fattening cattle. The percentage of proteid varies between about 30 to 44 per cent, the fat between about 9 to 18 per cent. It is possible to prepare two qualities, one rich in proteid and poor in fat, and the other rich in fat and poor in proteid. When, for example, the somewhat finely ground meal is sifted, employing a mesh of 1 mm., that which passes through is much richer in proteid and poorer in fat than the original, while the reverse is true of that which remains in the sieve.

© 1895 SCIENTIFIC AMERICAN, INC.

[FROM THE WESTERN UNIVERSITY COURANT.]

### Spectroscopic Observations of Saturn at the Allegheny Observatory.

In giving below, at the request of the editor of the Courant, an account of some recent observations of Saturn at the Allegheny Observatory, I have thought that a brief glance at the previous history of the subject would be of interest as an introduction; such a review is, indeed, necessary, in order that the reader may correctly understand the significance of the results which have been obtained at this place.

The hypothesis that the ring of Saturn is nothing more or less than a multitude of small bodies, revolving around the planet in circular orbits, is a very old one. It was suggested by Roberval in the seventeenth century, and was revived by Jacques Cassini in 1715, but in those days of course it had no better basis than mere speculation. These suggestions were forgotten, and when the great mathematician Laplace took up the question he regarded the rings as solid bodies. He arrived at the result that such rings could not exist in their actual form unless they were unsymmetrically weighted, and left the problem in this unsatisfactory state. At a later date Professor Peirce, of Harvard, showed that the rings could not be solid, and regarded them as composed of some fluid denser than water. Finally, the English physicist Clerk Maxwell discussed the whole matter thoroughly in a prize essay submitted to the University of Cambridge in 1857, and showed mathematically that the rings could be neither solid nor liquid, and that stable equilibrium would be impossible unless they were made up of separate bodies of no great size—"a shower of brickbats," he was in the habit of calling them.

It was indeed proved before Maxwell's time, by Edouard Roche, of Montpellier, that a body of considerable size cannot revolve within a certain limiting distance of a planet, as it would be torn to pieces by the strain due to unequal attraction, but Roche's investigations were long overlooked. In the case of Saturn this "Roche's limit," as it is now called, is just outside the ring, and hence it follows that the ring must be made up of separate small bodies.

Thus it will be seen that the accepted hypothesis rested on a mathematical demonstration that no other constitution of the ring is possible according to the laws of mechanics, and although the mathematical proofs are conclusive to those capable of appreciating them, a proof by direct observation was regarded as having so much importance that the results obtained at the Allegheny Observatory attracted the widest notice.

If there were any spots on the ring, the matter would have been settled long ago; but there are none, and the motion of the ring was measured at Allegheny for the first time by means of a spectroscope. According to a well-known optical principle, a line in the spectrum of a heavenly body is displaced toward the violet if the body is approaching the earth and toward the red if the body is receding. Now, as Saturn's ring rotates, one side is continually moving toward the earth and the other side away from it. Hence the lines in the spectra of opposite sides of the ring are displaced in opposite directions, and by photographing the spectrum, and measuring the displacement on the photograph, we can determine the velocity in miles per second. The moon has no motion in the line of sight, and by photographing its spectrum on the same plate, without disturbing the apparatus, we have a starting point from which the displacements can be reckoned.

But this is not all; the velocity of different parts of the ring will differ according to the way the ring is made up. A satellite must move in obedience to Kepler's third law, and a consequence of this law is, that the velocity of the satellite varies inversely as the square root of its distance from the center of the planet; the nearer a satellite is to the planet, the faster it moves. It is easy to calculate that, if the ring is made up of satellites, its inner edge must move at the rate of 13·06 miles per second and its outer edge at the rate of 10·65 miles. If, on the contrary, the ring is solid, its outer edge must move faster than its inner edge, just as the tire of a wagon wheel moves faster than a point nearer the hub. The outer edge would in fact move more rapidly by about five miles per second.

Now let us see what the photographs say. Here are the main results obtained from the measurement of two different plates:

Velocity of the middle part of ring, 11·2 miles per second.

Velocity of inner edge greater than outer edge, 2 to 3 miles per second.

Comparing these figures with those given further above, we recognize that the photographs contain a proof that the ring is made up of independent bodies, revolving as satellites.

Perhaps I need hardly say that such results are not obtained as easily as they are described. Some idea of the delicacy of the observations can be formed when I state that a velocity of one mile per second causes a displacement on these plates of only one twenty-five thousandth part of an inch, and that the image of Saturn, which the telescope casts on the slit of the spectroscope, must not move much more than one three thousandth of an inch during the long exposure of two hours. The plates are measured under a microscope, and while it is impossible to be certain of the fraction of an inch, an accuracy sufficient to decide in favor of the meteoric hypothesis of the constitution of Saturn's rings is quite readily attained.

JAMES E. KEELER.

### A Wax Found in Cotton and Linen Fiber.

BY CLAYTON BEADLE.

It is occasionally observed that the iron walls of a beater in which cotton and linen pulp is disintegrated become coated with a film, which protects the iron against the action of the bleach, etc. It appears that this film is not formed under ordinary conditions of treatment, as its occurrence is not generally known to paper makers. This wax-like film, when of sufficient thickness, can be readily scraped from the sides of the beater. A case of this formation was brought before my notice about two years ago. The formation of this film was so rapid as to cause inconvenience, and to necessitate constant scraping of the sides of the beaters, lest portions should detach themselves and form yellow spots in the pulp.

I examined samples of this substance taken at different times, and found that it consisted of alumina, iron and lime salts, mixed with a substance soluble in ether. The latter substance has a sweetish smell and generally resembles beeswax. It has a saponification equivalent (p.c.) of 19·46 (KOH), and a very definite melting point of 47·5 degrees C.

The wax on saponification gave 91·04 per cent insoluble fat acids. Samples were taken and examined at different times, and were found of constant composition. The raw material that gave rise to the formation of this substance had been previously treated under pressure in a 3½ per cent solution of NaOH, and afterward thoroughly bleached in calcium hypochlorite solution at 32 degrees C. The wax does not make its appearance until the bleached material is disintegrated. At the back of the beater roll a thin film may sometimes be seen on the surface of the water. This in time builds itself up on the sides of the beater. The characteristic sweetish odor of the isolated wax can be traced back often to the bleached material, which sometimes smells strongly.

I think there is evidence that this substance does not exist in the raw fiber, but is formed in the cell wall during treatment. It is hardly probable that this substance, which is readily dissolved by soda, should survive the treatment with alkali under pressure. The odor which is characteristic of this substance is not noticed in the raw material until after the warm bleaching, and appears to be more developed after the bleached material is allowed to lie heaped up in a dense condition for some time. By altering the mode of bleaching of the raw materials, the occurrence of this waxy substance can be prevented. I found in one batch of cotton fiber, that smelt strongly of the waxy substance, that the alcoholic extract amounted to 2·87 per cent, and, when treated with ether afterward, the ethereal extract amounted to 0·73 per cent.

The separation of the wax in the beater is merely a mechanical one, and is probably due to the fact that it intimately penetrates in the fiber. The knives of the beater roll, which tear the ultimate fiber asunder, release the wax, which floats on the surface as a fine film, and quickly builds itself up on the metallic surface with which it comes in contact. I succeeded in at one time collecting about 50 lb. of the deposit, which was found, on extraction with ether, to contain 77·54 per cent of wax.—Chem. News.

### Anthion—A New Agent for Quickly Washing the Hypo from Prints.*

BY DR. H. W. VOGEL.

We have in the preceding number, under the heading of "Novelties," already made mention of a stuff which we have several times tested as a destroyer of hypo, and which enabled us to shorten the washing process of prints and plates from one hour to forty minutes.

As our tests date back several months, we are convinced that pictures and plates thus treated are as permanent as those washed in the usual way.

It is self-understood that the saving of time is of importance to professional and amateur, both when quick work is required and where facilities and time are scarce. Especially amateurs who are deficient in patience will welcome this preparation. Of course, mistakes in its use will be made, but the test which is prescribed, and which always should be applied, points out such mistakes. Anthion is a white powder which but sparsely dissolves in water. One part requires 100 parts of water for solution. Warm water is recommended. We prefer to use solutions of 1:200; these will keep about four weeks. The sample placed at our disposal was a persulphate, $KSO_4$, and acted as an oxidizer. It changes hypo quickly to the harmless tetrathionate of soda (tetrathionic acid and soda base), liberates iodine from iodide of potassium solutions, especially in the presence of acid, while in alkali solutions (hypo-soda) the free alkalies materially accelerate the oxidizing effect. The hard salt proved stable. We performed the washing as follows:

A. Gelatine Plates.—1. The fixed plate, 13 by 18 cm., was placed for five minutes in about 500 c. cm. of water (more does no harm), shaking or rocking the dish repeatedly.

2. The plate thus rinsed was now put into a dish containing from 200 to 250 c. cm. solution of anthion 1:200 for five minutes, rocking again.

3. From this solution it was passed back to the first dish, which had been rinsed and filled with fresh water, rocking several times.

4. The plate is now passed back into dish No. 2, which had been rinsed and filled with fresh anthion solution as in 2 and 3.

When taken from the last water the plate was found free from hypo, and was put away to dry.

Tests.—Put into a clean glass about 10 c. cm. of the last wash water, and add two to three drops of nitrate of silver solution 1:20. A slight formation of chloride of silver will usually be seen. Should this become yellow, then hypo is still present, and process under 2 and 3 must be repeated.

This silver test is absolutely safe.

It must be remembered, however, that chloride of silver changes color in the light, and the test should be made in a weak light.

B. Paper Prints.—These wash out more readily than plates. But they must be kept well separated to admit the liquids from all sides.

Place as in 1 about five just fixed and drained prints, one after the other, in 500 c. cm. water (vide 1), then each separately into the anthion solution (vide 2), and continue as in 3 and 4.

Don't neglect the test.

To make sure that the anthion water did not injure the prints, a picture was cut into halves, one-half soaked in anthion water 1:100, allowing it to dry in. Not the slightest difference could be noticed between the two halves.

For larger plates or prints, of course, correspondingly larger quanties of anthion are required. Five months have failed to show any signs of fading of pictures treated with anthion.

Price of 100 grammes anthion, 1 mk.—Wilson's Photographic Magazine.

* Communication from the Photo-chemical Laboratory of the Royal Technical High School in Berlin, Charlottenburg.

### Daniel Webster on the Great West.

When we think of the teeming population which now fills many portions of our country west of the Rocky Mountains, and remember how famous, all over the world, is their singular beauty, and their incomparable value to the tourist, the health seeker, the agriculturist and the horticulturist, as well as the miner, it is interesting to read what so intelligent a statesman as Daniel Webster thought of them just fifty years ago, and to know that his views were shared by many other prominent public men of the time. In a speech delivered in the United States Senate in 1844, with regard to the proposal that a mail service should be established between Missouri and the Pacific coast, Webster said: "What do we want with this vast worthless area, this region of savages and wild beasts, of deserts, of shifting sands and whirlwinds of dust, of cactus and prairie dogs? To what use could we ever hope to put these great deserts, or these endless mountain ranges, impenetrable, and covered to their bases with eternal snow? What can we ever hope to do with the western coast, a coast of three thousand miles, rock-bound, cheerless and uninviting, with not a harbor on it? What use have we for such a country? Mr. President, I will never vote one cent from the public treasury to place the Pacific coast one inch nearer Boston than it is to-day."

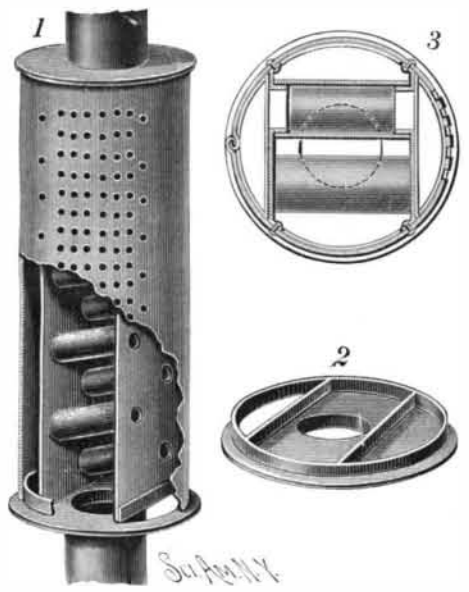
### Electrolytical Process of Bleaching.

In his recent review on progress in bleaching, in Lehne's Farberzeitung, Dr. Kielmeyer mentions an electrolytical process invented by Dr. Karl Kellner, which, whatever be its practical value, has at least the merit of being original. The necessary apparatus consists of a pair of rollers—the one iron, the other carbon—which, while rotating, are fed with an electric current by contact with wire brushes, and thus converted into the two poles of a battery. The cotton cloth, before passing these rollers, is saturated with brine, and runs in company with an endless felt blanket, also saturated with brine, which is next to the iron roller, and receives the caustic soda formed, to deliver it further on into a tank filled with salt water. The chlorine liberated at the carbon roller accumulates in the cotton fabric. On issuing from between the rollers (whereof there may be several pairs) the cloth remains rolled up for some time, before it is washed, to prolong the bleaching process. Whether the process has already found practical application does not appear in the paragraph referred to.

© 1895 SCIENTIFIC AMERICAN, INC.

### A HEATING DRUM IN THE SMOKE PIPE.

In many cases where the pipe or smoke flue from a furnace, stove, or range, may be passed through another room before reaching its connection with the chimney, it will be possible to heat the second room, at least to a very material extent, by placing in the pipe a heating drum such as shown in the accompanying illustration. It is a patented improvement of Mr. James W. Johnson, of Paullina, Iowa. In the exterior

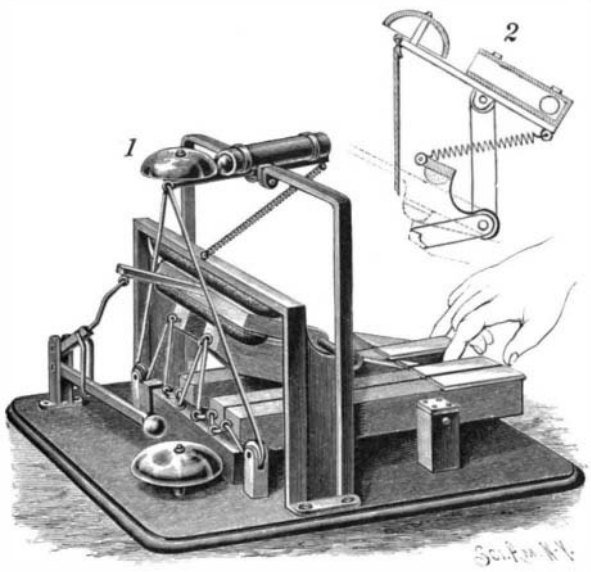



JOHNSON'S HEATING DRUM.

shell of the drum are partitions forming air compartments at the sides, as shown in the broken-away portion of Fig. 1, and there is a central smoke and gas passage crossed by obliquely arranged flues. In the lower head is an opening at one side, as shown in Fig. 2, permitting the air to enter one of the side compartments, whence it passes through the flues and is heated thereby, finally passing through the perforations in the exterior shell into the room. Fig. 3 represents a cross section of the drum. Gas-tight joints prevent smoke and gases from the smoke passage entering either of the air compartments at the sides, and the air passing through the flues is thoroughly heated before being returned to the room through the perforations.

### TO FACILITATE ATTAINING CORRECT TOUCH ON THE PIANO.

An instrument designed to facilitate the systematic development of finger technic, affording also an improved exercising device for beginners on the piano, is represented in the accompanying illustration, and has been patented by Mr. Oscar Felden, of No. 707 Hamilton Street, Houston, Texas. It comprises a series of mute keys and two bells or sounding devices of different pitch arranged so that when the keys are wrongly




FELDEN'S FINGER EXERCISING DEVICE.

played one of the bells will be sounded. The keys, pivoted in a suitable frame, have at their rear ends eyes through which extends a cord, the cord also passing through eyes on a fixed transverse beam and around pulleys at its end, and thence connecting with the rear end of a lever fulcrumed on the frame, the lever having at its front end a tube closed at one end, a ball resting normally at the closed end of the tube, as shown in Fig. 2. At the rear end of the lever, facing the open end of the tube, is a bell, a spring normally holding the lever in its inclined position, but when the player holds down a key too long, and until after the second key is pressed to the bottom, a pull is exerted upon the cord which causes the lever to swing up, as shown in Fig. 1, the ball then rolling along the tube and sounding the bell. Over the rear ends of the keys is fulcrumed another lever, having at its under side a cushioned rail normally resting on the keys, whereby the lever is swung upward when either of the keys is pressed, and on the rear end of this lever is an eye engaged by an arm fulcrumed in a bracket, the arm being connected by a loop with a striker adapted to sound another bell. With the correct touch, neither of the two bells will be sounded, the time it takes the ball to roll through the tube being the time allowed to raise the finger which strikes the first key, but if the player does not hold the key down until the second key is struck, an interval occurs between the two tones and the pivoted arm then actuates the sounder to strike the second bell. The device is thus designed to facilitate the acquirement of a correct legato style of playing, or the holding of the sound of one tone to the exact instant that the next tone commences to sound, for by the pressing upon the second key when the first is still held down one of the bells is sounded, and by allowing an interval between the touch upon successive keys the other bell will be sounded.

### Making a Newspaper.*

In a large newspaper office, as in the Tribune in New York, for example, where there may be one hundred men who are attached to the paper as writers, as correspondents, as reporters, and to the strictly editorial department, out of this one hundred, sixty or seventy will be reporters. that is, men who are sent out when any event of interest occurs, when a bank breaks, when a great fire takes place, when there is an earthquake, to inquire into the facts and collect information, and to put that information into form, so that it can be printed the next day. That is one of the most important branches of the profession, and it is paid very liberally, I am glad to say. For instance, I know many reporters who earn ten or fifteen dollars a day, and some who earn more. They have constant employment, and their labor is entirely agreeable to themselves. That is one of the first things, when a young man comes for employment, and you take him on and give him a chance, that he is set to do. There, you see, all this culture that we have been considering is at once brought into action. He must learn accurately the facts, and he must state them exactly as they are; and if he can state them with a little degree of life, a little approach to eloquence, or a little humor in his style, why, his report will be perfect.

Next to the reporter, a very important functionary in the newspaper is the man who reads the other newspapers and makes extracts from them. Mr. Greeley used to think that it was enough to make a good paper if he had an able man to read the exchanges, provided he himself was there in person to add up the returns of the elections. The man who reads the exchanges is a very important man; and, let me say, too, he is a pretty highly paid man. He has to read, we will say, three thousand papers regularly. All the newspapers in the country come into the office, and he does not do anything else. He sits at his desk all day, and a pile of newspapers, or, say, a cord of newspapers, is laid before him every morning; he starts to work and turns them over and over to see what is in them. He has to know what it is that should be taken from them and put into his paper. What is the interesting story? It requires judgment to know this; it requires knowledge and experience as well as talent. It also requires a sense of humor, because there are a great many things that are really important that may not seem so at the first glance, and the newspaper reader has got to judge about that. He must always be on hand and spend a great many hours at his desk; and he is pretty tired when he gets through with his day's task.

Next to the exchange reader in the newspaper organization comes the man whose duty it is to receive manuscripts and examine them and prepare them for the press, to edit them, correct them; where the writer has made a little slip of rhetoric, to put the right word in or the right turn of the phrase; to clarify it all; to make the sentences clean. That is a hard job in the writing of a great many persons.

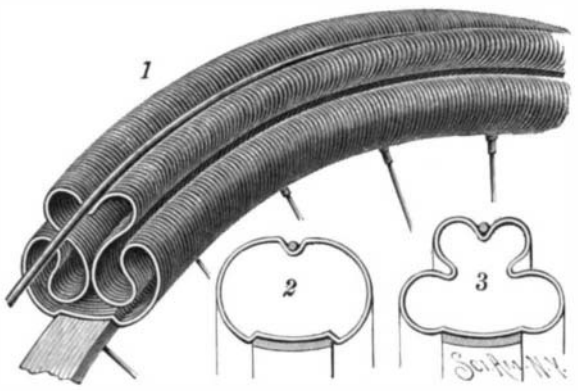
Then finally you come to the editor-in-chief, and he is always a man who gets into his place by a natural process of selection. He comes there because he can do the work; and I have known some young men who had no idea that they would ever have control of a newspaper, who have risen to that place, and who have filled it with wisdom and success and force. Yet at the bottom of it all, it is always a question of character as well as of talent. A fellow that is practicing arts of deception may last a little while, but he cannot last long. The man who stays is the man who has the staying power; and the staying power is not merely intellectual, it is moral. It is in the character.

News is undoubtedly a great thing in a newspaper. A newspaper without news is no newspaper. The main function of a newspaper is to give the news and tell you what has happened in the world, what events have occurred of all sorts, political, scientific, and nonsensical. What a wonder, what a marvel it is, that here, for one or two cents, you buy a history of the entire globe of the day before!

*From a lecture delivered to the students of Union College by Charles A. Dana, editor of the New York Sun, and printed in McClure's Magazine for May.

### AN ELASTIC TIRE FOR VEHICLE WHEELS.

The illustration represents a tire designed to have the characteristics of a pneumatic tire, but which is not inflated, and which it is purposed shall be far more durable than the ordinary rubber tire. It is made of spring wire, in sections or as a series of continuous or connected members, presenting a neatly fitting base section for the felly, while its outer surface expands under pressure in contact with the ground. The improvement has been patented by Mr. Alexander Honrath, of St. John, Kansas. Fig. 1 shows the preferred form of construction, Figs. 2 and 3 being sectional views of modified forms. The sections or members are held firmly and compactly in position by a tie rod or wire of suitable size, located in a central recess in the outer surface of the tire. If found desirable in




HONRATH'S ELASTIC TIRE.

practice, the tire may be partially or entirely covered by a casing of leather, rubber, or similar material.

### IMPROVED FAUCET FOR BASINS, SINKS, ETC.

This faucet has a valve stem held movably in the valve casing, and provided with a service valve and an auxiliary cut-off valve, both moving with the stem, to permit of readily shutting off the water from the service pipe whenever it may be necessary to repair the service valve, valve seat, or other part of the faucet. The improvement has been patented by Mr. John Byrne, No. 871 East One Hundred and Sixty-ninth Street, New York City. As plainly shown in the sectional view, the casing is made in three sections, screwed one on the other, the middle section having at its upper end a valve seat adapted to be engaged by a disk valve on the square part of a stem moving in the valve casing. The valve preferably has a facing of rubber or leather, to make a tight joint, and it is held in position on the stem by a nut, the upper part of the stem passing through a stuffing box in the top of the upper section. The valve stem is held movable in the casing by a threaded portion screwing in a spider forming part of the middle section, a plan view of which is shown in the small figure, allowing the valve to be opened and closed on turning the handle.

On the lower end of the stem is an auxiliary valve adapted to engage a second valve seat in the lower part of the middle section. This valve is preferably held loosely on a flange on the lower end of the valve stem, and is normally off its seat when the faucet is used in the usual manner, but in order to repair the upper and ordinarily used valve seat or valve, the stem is moved upward beyond the normal position, until the lower valve is engaged with its seat, shutting

BYRNE'S FAUCET.

off the water from the middle and upper section and the spout. On removing the handle, the upper section can now be readily removed, affording access to the valve seat and valve for any repairs which may be necessary or the putting in of a new valve, and obviating the necessity of shutting off the water supply in the service pipe from the main.

© 1895 SCIENTIFIC AMERICAN, INC.

### TO THROW LIFE LINES FROM VESSELS.

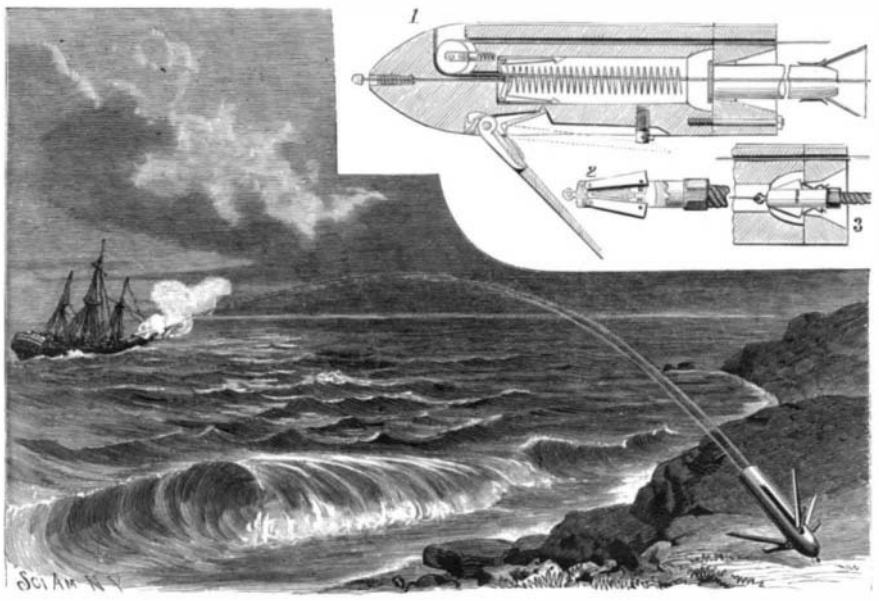
To facilitate establishing communication from a disabled or drifting ship with the shore, Mr. Anton Schmitt has patented the apparatus shown in the accompanying illustration, the introduction of which is being promoted by the Rev. Albert Stroebele, of Butler, N. J. On the vessel is carried a cannon adapted to fire a projectile in the form of an anchor having grapnel arms, to hold the anchor where it strikes, the anchor carrying a line having one end fastened on the carriage of the cannon while the other end unwinds from a drum on the carriage, the two ends of the line thus remaining on board the vessel. One end of a line thus connected with the shore may then be attached to a heavy chain or cable, and the latter drawn out and fastened in the anchor, affording means, by the aid of a drum or windlass on shipboard, of drawing the vessel toward the shore. Fig. 1 is a sectional side view of the anchor, whose body has a bore registering with a conical bore in the base, through which passes one run of the line, which extends around a pulley in yielding bearings in the head, and through registering apertures in the body and base, to return to the drum on the carriage. A tube loosely held in the bore of the body is adapted to engage a funnel in the base to form a guideway for the head of the heavy chain or cable when the latter is to be connected with the anchor, as shown in Fig. 3. On the front of this tube is a flanged cap, on which presses a spring normally compressed by hooks which engage the flange, the hooks being pivoted at their rear end on links connected with a rod extending to the front end of the body. The head of this rod first strikes the ground when the anchor is fired, disengaging the hooks and permitting the spring to force the tube and funnel outward, as shown in Fig. 1. Pivoted in recesses in the sides of the body are three grapnel arms, each arm being recessed to receive a pivoted arm. Each arm is normally held in closed position by the wall of the barrel, but they are all forced outward by springs when the anchor is fired, the shorter arms being rigidly and the longer arms elastically held open. The head for the chain or cable to be connected with the anchor by means of the lines, after the anchor has been thrown ashore, has pivoted wings normally folded into a recess of the head, as shown in Fig. 2. These wings are spring-pressed, and are closed when drawn through the funnel in the base of the anchor, after which they swing outward and abut against the inner face of the base, whereby the head is securely connected with the anchor, and a strong connection is thus made between the anchor and the vessel.

### Aliens May Become Engineers.

Aliens who have resided in the United States for six months or more, and who have declared their intention to become citizens of the United States, can be licensed as engineers or masters in the American merchant marine. Such was the decision of Attorney-General Olney in the question referred to him by Secretary Carlisle as to the legality of the action of Secretary Foster in granting licenses to the alien engineers who were serving on the American Line steamers New York and Paris at the time they were granted American registry under special act of Congress. General Olney decided that the action of Secretary Foster was valid, and that the act of 1874, under which he acted, was still in force, and unrepealed by the act of 1884, known as the Dingley act, notwithstanding the contention of the National Association of Marine Engineers of the United States that it had been repealed.—American Shipbuilder.

### A New Use for the Bicycle.

The wheel is in use everywhere and for nearly every purpose. According to the Lancet, London, a new ambulance carriage has been invented by Dr. Honig, of Berlin. It is not drawn by horses or men in the ordinary way, but is propelled by cyclists, and consists of a kind of litter resting on a frame with five wheels, three in front in the form of an ordinary tricycle and two at the back. The drivers, accordingly, sit one at each end of the litter, which is covered by a removable roof with little windows and a pneumatic bell, so that the patient can communicate with the drivers. Beneath the litter are boxes for dressing materials, instruments for first aid, etc. Dr. Honig suggests that his invention would be useful in small towns for which a horse ambulance is too expensive. It brings the surgeon and his assistant very quickly to the scene of an accident and enables them to remove the patient to a hospital.



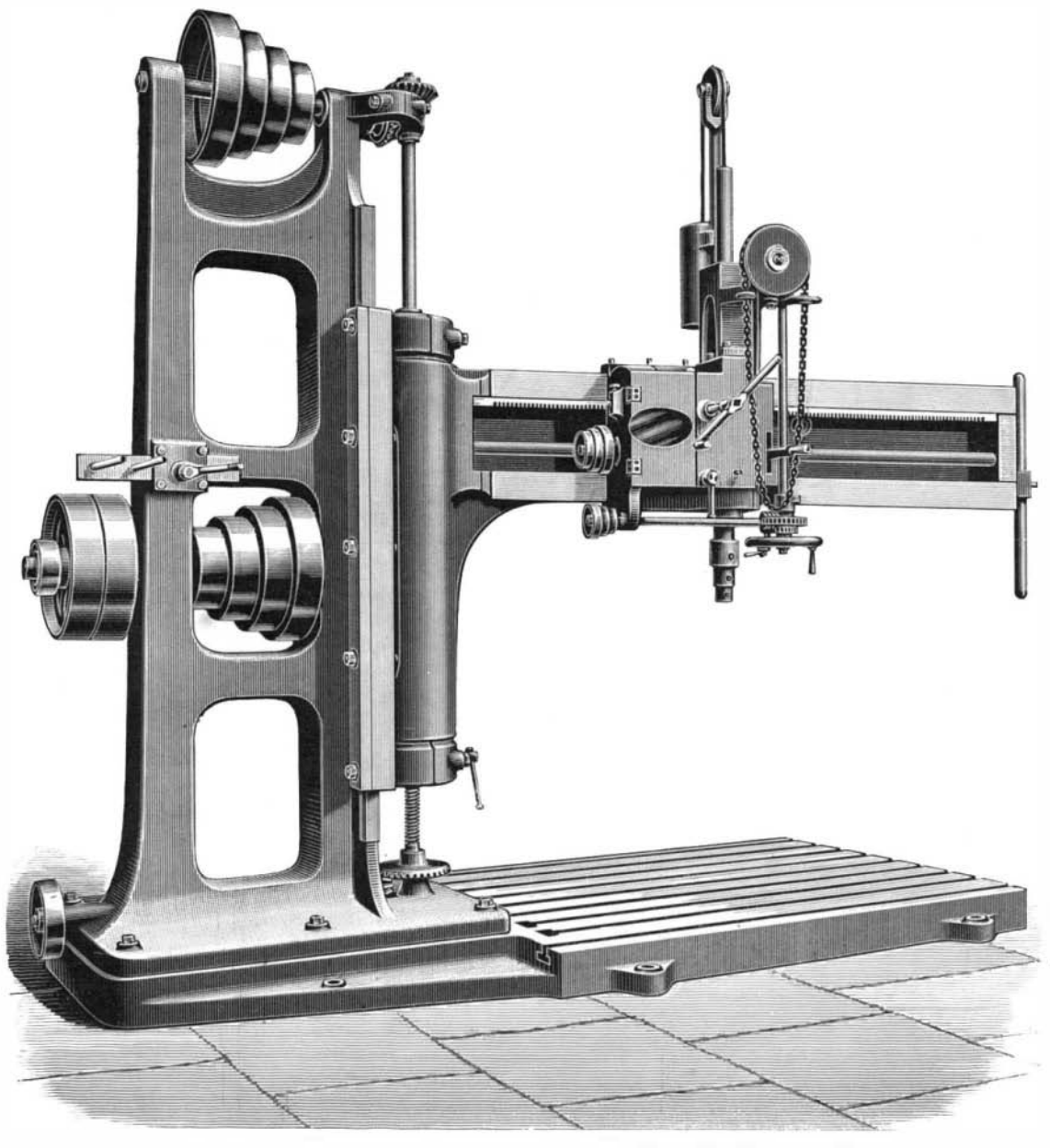

SCHMITT'S LIFE LINE THROWING APPARATUS.

### IMPROVED RADIAL DRILLING MACHINE.

A radial drilling machine, by Messrs. Craven Brothers, London, makes short work of drilling, tapping and studding the upper flange of a crank chamber. The Engineer says, "So quickly does it get through its work that, as we look at it, we take a sort of childish pleasure in standing and watching it till the whole set of studs is dispatched—similar to the pleasure, which we all know at some period of our lives, of seeing an express train go by. It has been expressly designed to tap and bore holes up to 1⅛ in. diameter. The radial arm is carried by two trunnions on a vertically adjustable slide, and admits 3 ft. 9 in. up to 6 ft. 3 in. high from the face of bed plate. The radial arm is fitted with a clutch motion actuated by a lever in front of the drill head to rotate the drill spindle in either direction or to stop it instantly. The spindle is balanced and fed down by a steel out rack, and is adjustable to drill from 2 ft. 4 in. to 7 ft. radius.

"Perhaps the speed at which we saw this machine doing the work, i. e., drilling the hole, tapping it, and driving home the stud, as we timed it, in one minute, should be in some measure attributed to the nimbleness of the operator, and again in some measure to small improvements made by Messrs. Willans and Robinson.

"In the first place they make their own taps with a special shoulder, which, on arriving at the surface of the flange, stops all further progress of the tap. Another little feature which, vulgarly speaking, is certainly 'a tip,' is in the section of the drill stock where the drill is held by it—only one half of the inner wall of which is turned true. The remaining semicircle is cut away, so that a drill can be hurriedly inserted without much chance of missing the hole. When once entered, however, it quickly finds its place under the influence of a set screw, which binds it hard to the true surface, as in the accompanying cut."



RADIAL DRILLING, TAPPING, AND STUDDING MACHINE.

### The Oleander.

The oleander is surely a thing of great beauty. No plant is easier to manage, the flowers are so pretty in both form and color and possess a fragrance of their own, therefore making it most desirable in every respect.

The plant will thrive and bloom in almost every kind of soil. The best results, however, are obtained by using good, rich leaf mould. While growing it requires an abundance of water, and when about to bloom should be given waterings of liquid manure occasionally. This will insure an abundance of large, perfect and brilliant flowers.

It may be set in the open ground in spring and in the fall dug up, carefully keeping as much dirt as possible about the roots; placed in a tub and then transferred to the cellar for the winter.

This plant is so easily grown that no flower lover should be without it, all they require being good soil and liberal watering when needed.

### Grape Fruit as a Tonic.

Grape fruit, plump and juicy, is in market again, a harbinger of spring. This fruit is an admirable tonic, as well as a most appetizing breakfast or luncheon relish. A doctor says that the sharp stimulus of fruit is the best thing to set the digestive organs in order for the day, and the peculiar properties of the grape fruit give it marked medicinal value.

When eaten at luncheon it is prepared in a different way than for breakfast service. For the second meal the contents of two halves should be scraped out, the seeds and tough cone of dividing skin taken out and the pulp and juice thus obtained used to fill one of the halves, which it will just about do. A tablespoonful of sugar and one of rum or sherry mixed with the juicy pulp adds the perfecting flavor. At breakfast, with the long pointed orange spoon, the meat is eaten out as is that of an orange and very little sugar is used, many persons preferring none, on the ground that its full medicinal value is better obtained.—Popular Science News.

© 1895 SCIENTIFIC AMERICAN, INC.

### Stained Glass, Ancient and Modern.

The limitations of the early manufacture of glass were an advantage to the early workers. The small size of the first sheets of colored glass made it necessary that the designer should execute his work in small pieces, insuring a juxtaposition of color. Much of the beauty which we now recognize and admire in old work is due to the fact that the artist or artisan was forced to subdivide his design into almost infinitesimal pieces in order to execute the same with economy in reference to material employed. Many happy accidents have thus been handed down to us.

The celebrated windows at Notre Dame owe their great brilliancy and charm of color to the above-mentioned fact. The celebrated glass at Saint Chapelle, so much written about, owes also its effect to this minuteness of detail.

The windows of the Seven Sisters in York Cathedral, England, are said to have been made by apprentices, and also, we are told, were executed from a lot of remnant glass that was supposed to be practically worthless. The result obtained was so successful, and has been so much praised by connoisseurs from that time to the present, that these windows now stand as possibly the best example extant of their peculiar kind of work.

If we look at the early Dutch, Belgian, French, or English specimens, we find practically the same influences at work in all these different schools—a certain simplicity of background with an elaboration of detail in some one central point, in most cases an escutcheon or family coat-of-arms. In the early Swiss glass we find this idea of centralization of ornament carried still further, while the regular escutcheon, family coat-of-arms, etc., were executed as in other cases, and imaginative center pieces were invented by the designer. Great numbers have been handed down to us, filled with all sorts of fantastic castles, knights, etc., just as the mood happened to strike the artist or artisan at work.

More elaborate glass treatment is to be found in the early figure work placed in the large cathedrals and churches throughout Europe. Here the same influence was at work, and in almost all cases secured an excellence of color which could not have been obtained by preconceived design, and that was the necessity of the workman to so subdivide his design as to represent all details by very small pieces of glass. The result in these larger windows was the same as in the smaller lights already mentioned, and beauty and juxtaposition of color was obtained, unsurpassed, unrivaled even at the present day.

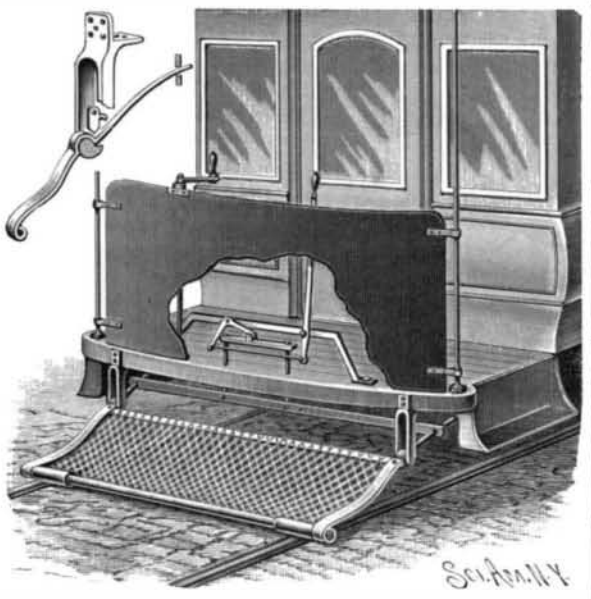
Age has also added to the beauty of cathedral glass. The climate in certain countries, especially in England, has so soiled and dimmed these windows that they now have an artistic quality of color unrivaled by any work produced at first hands. This point was most strikingly exemplified when, a few years ago, an attempt was made in England to cleanse certain of the old cathedral windows, the beauty of which had been famous for many centuries. No sooner had the workmen performed their task than the windows were found to be crude and garish in color, much of the very quality which had caused them to be models for later glass work was destroyed, and the value of the windows completely lost. This is but one of the many instances which could be given to illustrate the statement that the peculiarity of the color of the old windows is produced by age and accident more than by the ability of the glass workers first executing them.

The modern glass worker is expected to obtain the rare color of the old work with the more perfect design and drawing of modern times. The task is not an easy one. In order to obtain the brilliancy of color of the old cathedral glass, the modern designer must of necessity so subdivide his window as to gain the same juxtaposition of color by the use of very small pieces. As these pieces are of necessity fastened together by the leads, the result is a large mass of black in the completed window. For this reason many of our most prominent designers have lowered the tone of glass so that their windows are almost black; in fact, the color is visible only on a bright, sunshiny day. This depth of color has been called for by the great number of black lines introduced, and by the mechanical necessity of putting the glass together with leads. An effort is being made at the present time to overcome this difficulty. The modern designer is attempting—with what success will soon be shown—to produce a stained glass window which is not only rich in color by the juxtaposition of different tones, but is also light in color. The mechanical difficulties are very great, but the improved leads now used, and the modern stiffening bar, it is hoped, will be able to overcome these.

In household work the modern designers may truthfully be said to have far surpassed the work of their ancient fellow-craftsmen. Outside of the simple, clear leaded lights of the Dutch and Belgian school, and the heraldic light of the middle ages with their coats-of-arms, escutcheons, etc., little household glass can be said to have been executed up to the present time. Now, however, this has been changed. Every building of any importance has some small portion of leaded glass. Every city hall, every State house, every private residence of any importance, has one or more leaded lights, in many cases a great number, and this constant demand for leaded work has created a school of glass in America which is unsurpassed by any other at the present day. The use of the delicate American opal for the accentuation of the ornament against a background either in clear white, white rippled, white Venetian or white cathedral, has opened up a field of design which has never been equaled.—Kate Field's Washington.

### A FENDER FOR CABLE OR TROLLEY CARS.

The illustration represents a light and inexpensive device, readily transferable from one end of the car to the other, for picking up and carrying without injury until the car is stopped persons who may be caught in the way of a moving car. It has but few parts, may be readily raised and lowered by the gripman or motorman, and its supports are clear of the tracks, bumpers, and drawheads of the car. It has been patented by Mr. Louis F. Trinchard (address in care of F. Querens, Jr., P. O. box 905, New Orleans, La.) The main frame of the fender consists of two end bars, shown in full in the small figure, and a front bar held at its ends in the eyes of the end bars. A central intermediate semicircular socket section of the end bar rests on a pivot bar of a bifurcated hanger, there being a latch above the pivot bar, and the rear end of each end bar is received in an opening in a transverse suspension bar connected by a yoke with a bridge bar just behind the dashboard, as shown in the broken-away portion of the main view. On this bar is an elbow lever connected with a hand lever, by moving which to the right or left the fender may



TRINCHARD'S CAR FENDER.

be raised or lowered. The front bar of the fender frame has at its ends rollers adapted to travel on the rails when the fender is lowered.

### Well Cared For.

This means much in homing pigeon keeping. Your feed must be of the best, and your supply of water the freshest and in plenty; also a pan of grit and ground oyster shells, good small Canadian peas, and some vetches, together with hulled oats, are the correct standard feed for the American racer at this period, with a few handfuls of small corn during an occasional cool spell or after a hard fly, and you must not forget the bathtub on every bright and warm day. The bathtub for the racing homer, I think, is a superb institution and works wonders, despite the fact that very many of the best Belgian fanciers rarely supply them to their birds. It is within the power of any of our young flying fanciers to bring their birds into fit racing condition, if they are patient, attentive, and watch their birds closely, giving them the best quality of feed obtainable, and not try to breed from and race their birds at the same time. All this, coupled with a clean, sweet loft, ample ventilation, and enough exercise without fatiguing them, will certainly have good results; but if they think all this too much trouble and feed and breed indiscriminately, with lots of hemp seed, common and cracked corn, and lazily loaf around in the sunshine and the loft all day, then they will score more misses than hits, and the 200 miles station will settle them sure.—Amer. Fancier.

### Honors for Lord Rayleigh.

The fortunate discoverer of argon has been made the recipient of the Faraday medal, which is a gift of the London Chemical Society.

A recent issue of the SCIENTIFIC AMERICAN (May 11, 1895) in a review of the late meeting of the National Academy of Sciences, held in Washington, also calls attention to the fact that the Barnard medal was this year given to Lord Rayleigh for his discovery of argon in the atmosphere.

## Correspondence.

### Repairing Commutators.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of April 27, G. H. G. asks for some composition for filling cracks in a commutator. You reply that the only way to repair will be to take the commutator apart and replace the mica. But if he happens to have no appliances for this work, a temporary repair can be made of thick shellac solution and dry plaster of Paris. Fill the crack with the shellac, then put on the plaster, kneading with a knife blade until it is stiff and smooth. Let it dry five or six hours or longer before scraping off the top even with the surface. It should be thoroughly dry before the armature is used.

I have used this method for repairing street railway motor armatures for more than a year, and no armatures have come back in that time for a fault due to this filling. A. A.

Covington, Ky.

### A New Italian Lake.

To go to bed in a plain and to get up on the banks of a lake, to lie down an agricultural laborer and to wake a fisherman, is not a common experience, says the Florentine correspondent of the Scotsman, even in these days of telluric storm and seismic convulsion. Such, however, is precisely what has just happened, and not many miles from Rome. Alighting at the station of Monte Rotondo, famous for a Garibaldian victory, which preceded by a few days the Garibaldian defeat at Mentana on November 2, 1867, you proceed to Leprignano, not far from Castelnuovo di Porto. This is a hamlet numbering about one thousand souls, chiefly agricultural in their calling. It stands some 600 feet above the sea level, on a plateau to the right of the Tiber, near the valley watered by the Gramicia torrent. Few visitors but those interested in Etruscan antiquities are ever seen at Leprignano, quite unattractive as it is, except for the ruins of Capena, that ancient Etruscan city whose importance may even now be gaged by the number and quality of its tombs. On the morning of the 8th instant, however, the little hamlet was conscious of a profound rumbling, the preliminary to further sounds of similar import, announcing the noise it is now making in the world. On the 12th and 13th the rumbling was repeated, and on the latter date it was found that the soil occupying a space of six hectares had collapsed, and that the vacuum had been filled with water, forming quite a respectable lake. Sulphurous gases bubbled up to the surface, disclosing the springs from which the lake is fed, while from its raw margin emanated similar exhalations, finding their vent through the numerous cracks that run their eccentric course around it. All the countryside turned out to witness the improvised sheet of water, and some young peasants, more adventurous than their fellows, advanced toward the brink, only to feel the earth giving way beneath them and to get a good ducking. The extreme unsteadiness of the surrounding soil, indeed, favors the view that the lake will gradually widen in circumference, for already there have been landslips at various points of its margin, followed immediately by a rise of the water.

### Fires Caused by Incandescent Lamps.

An investigation into the cause of a fire in a Winter Street dry goods store, in Boston, recently, resulted in demonstrating that an incandescent electric lamp will generate sufficient heat to set inflammable material into a blaze. The fire in question, for which a still alarm was given, was caused by allowing an incandescent lamp to remain for a few moments on a pile of cotton cloth in the packing room. The person in charge left the room for a few moments, not dreaming but that it was safe to leave the lamp on the cloth. When he returned the cloth was blazing. The fire was soon put out, and not much damage was done.

This case recalls one reported from Louisville, Ky., a few months ago, the Boston Journal of Common adds, which demonstrates the same thing. The fire started, says the Insurance Herald, while the window dresser was preparing a Christmas snow scene. The window was lighted with incandescent lights, which it appears had not been changed for a year, except when made necessary by accidental breakage. The carbon in an incandescent globe has a life of 600 hours, and as it wears out the carbon loop offers increasingly less resistance to the current, and, therefore, increasingly more heat is thrown off upon the glass bulb and even upon the metal stems to which the globes are affixed. When a new light is attached the globe becomes only warm under continuous use, but after it gets old the globes are hot and the stems attain burning heat. The dresser was filling the floor of the window with loose cotton upon cheesecloth, to represent snow. This was packed closely around the stems and globes of the electric lights, and there is no doubt that the inflammable cotton, touching the burning hot stems and globes, caused the fire.

© 1895 SCIENTIFIC AMERICAN, INC.

### THE AMERICAN YACHT DEFENDER.

The series of races in which the Valkyrie, as the British champion, attempted to win the America's cup in competition with the American yacht Vigilant took place off Sandy Hook in the autumn of 1893, the first race being sailed Saturday, October 7, the second, Monday, October 9, and the third, Friday, October 13, in all of which the Vigilant was victorious. Now work is being rapidly pushed forward on an American yacht which has been aptly named Defender, which will probably compete with a British yacht next September for that great blue ribbon of the sea which still remains in the land of its naturalization. After the defeat of the Valkyrie Lord Dunraven's challenge was of course a foregone conclusion, and all yachtsmen and the general public as well are looking forward to the races which will be sailed off Sandy Hook in a few months for the time honored trophy, for yacht racing probably appeals to a much larger section of the community than any other form of sport. The most important concession granted to Lord Dunraven this year was the right to choose his boat as the New York Yacht Club does at present, so that in all probability not only the Valkyrie III. which the Dunraven syndicate are building, but the Fife cutter Ailsa will be brought over and trial races sailed off Sandy Hook to determine which shall be the British champion.

In America we have, as it were, put all our eggs in one basket, and are relying almost entirely on the Vanderbilt-Morgan-Iselin boat Defender, which the Herreshoffs are building at Bristol, R. I., as this boat will probably have to race against the pick of two modern cutters designed by the two foremost naval architects in Great Britain. The order for the Defender was placed last January with the Herreshoffs, who are undoubtedly the greatest yacht designers in the world, and they are under contract to deliver the yacht June 15, and her trial races will be sailed soon after to see if any modification as to rig is required.

The Defender is a sloop yacht. The approximate measurements are as follows. The exact measurements have not as yet been made public, for from the time of their conception until long after launching the cup defenders have ever been mysteries to the public, and the present yacht is, if anything, more so than the preceding ones. This secrecy must be maintained, so as to keep the lines and dimensions from rivals and those interested in the challenging yacht.

The present figures, although in some instances unofficial, will probably be but little out when comparison can be actually made.

The Defender is not far from 126 feet over all and between 89 and 90 feet at the water line. The beam is about 23 feet, draught about 19 feet. She has no auxiliary centerboard forward, but is an out and out keel boat. She has a 35 foot lead bulb weighing 60 tons. In the lead bulb of the Defender, Herreshoff has remedied a serious defect in the Vigilant. Where the latter in a heavy sea pounded with her flat outside ballast, the Defender will rise and fall without pounding, as the egg-shaped form of her ballast gives easy entrance and withdrawal.

The Tobin bronze plates, as used in the Vigilant, have been superseded by manganese bronze plates below the water line, and above it as far as possible they are of aluminum with an alloy of about ten per cent of copper to resist corrosion and give added strength.

Not only is the upper portion of the plating of the Defender of aluminum, but the deck beams themselves are of the same material, and the saving in weight over steel will be more than double the amount saved by the plating. The total saving effected by the use of aluminum is estimated at seven tons, which is expected to tell greatly in favor of the Defender in the races. A dispatch from Boston states that the mast is 102 feet long; boom, 102 feet; gaff, 64 feet; bowsprit, 44 feet; topmast, 61 feet 2 inches; spinnaker pole, 72 feet. These dimensions may be slightly decreased in fitting. It is said that the Defender will have 7,000 square feet of canvas in her mainsail alone, and her total sail area will be from 12,500 to 13,000 square feet. The distance from the deck to the hounds will be about 72 feet. The Defender's principal gain in sail area will be in the mainsail, the spinnaker being somewhat smaller than that of the Vigilant. One of the most interesting features of the Defender is the manner of working the sails. All the halliards will be led below through tubes in the deck, and they will be worked by means of powerful winches.

The main sheet will also be led below, where it can be handled by a few men with the aid of a winch. Possibly the same may be done with the sheets of the head sails, but many of the details of the yacht are still kept secret. Much of the heaviest work of trimming sheets can thus be carried on below the deck, leaving the deck itself clear for other work. Our full page engraving represents the Defender as she will probably appear at the race with spinnaker set. Our smaller views give a side elevation and a half bow, half stern elevation.

It is of course still a question whether the Defender will be selected to compete, but there seems to be a very general opinion that the safety of the America's cup rests almost entirely with the Defender, for each new boat has been better than the last. The international yacht races have promoted an honorable rivalry among yacht designers, and serve the wholesome purpose of quickening patriotic feeling.

### Natural History Notes.

The Dancing Hammerkop.—The hammerkop, a bird of peculiar habits, is found in Cape Colony, some other parts of Africa and in Madagascar. It is something like a heron or stork, has a melancholy gait, lives on fish and frogs and is considered in Africa a bird of ill omen. Under its quiet appearance it nourishes æsthetic tastes. When it casts off its sober demeanor, it indulges in a fantastic dance. In a state of nature, two or three join in the dance, skipping around each other, opening or closing their wings. They breed on trees or on rocky ledges, forming a huge structure of sticks. These nests are so solid that they will bear the weight of a heavy man on the domed roof without collapsing. The entrance is a small hole, placed in the least accessible side. In a lonely rocky glen, Mr. Layard once counted half a dozen of their nests, some almost inaccessibly placed on ledges of rock. One nest contained at least a large cartload of sticks. They occupy the same nest year after year, repairing it as required. The female is credited with the joiner work and the male is the decorator. On the platform outside the inner portion he spreads out all kinds of objects of virtu, brass and bone buttons, bits of crockery and bleached bones.

If a knife, pin, or tinder box were lost within some miles, the loser made a point of examining the hammerkops' nests. Indeed, were it not that hyenas, leopards, and jackals ranged in their vicinity, it is highly probable that man's curiosity or resentment would have often extirpated these interesting artists, or, at least, destroyed habits founded upon leisure and immunity from persecution.

The Courting of Animals.—This subject seems to prove attractive to many naturalists. In Vol. X of the "Transactions of the Wisconsin Academy of Sciences," there is a highly interesting paper by Mr. and Mrs. Peckham on the "Courtship of Certain Spiders." It seems to be the case that the sharpness of vision in spiders is accentuated by love. A male of Satis pulex was put into a box in which was a female of the same species twelve inches away, and the male "perceived her at once, lifting his head with an alert and excited expression, and went bounding toward her." By experiments it was proved that this recognition was really due to sight. These results are interesting, because some have affirmed that spiders cannot see nearly as far as twelve inches. Further experiments seem to show that spiders can differentiate color. M. Racovitza, a Roumanian naturalist, has been studying the courting and marriage customs of the octopus, and in a recent number of the "Archives de Zoologie Experimentale" he gives us some of his observations. It is satisfactory to know that the octopus does not, as some have thought, behave brutally in its love affairs. M. Racovitza assures us that "there is nothing more than a courteous flirtation," and that "the male behaves with a certain delicacy toward his companion." —Science Gossip.

Agricultural Ants.—Prof. W. J. McGee, of the government scientific corps, recently paid a visit to some very remarkable farmers in Sonora, Mexico. These are the so-called agricultural ants, which plant fields of grain and regularly harvest their crops, upon which they depend wholly for food. In fact, should the crops fail, they would perish of famine. On the other hand, the cereals that they grow have been specialized by cultivation, like the wheat and other grains of the human husbandman, and would quickly disappear if the attention of the insects was withdrawn.

The fields of the farmer ants cover scores of square miles in Sonora, a large part of which is quite densely populated by them. The home of a colony is marked ordinarily by a circular clearing from five to thirty feet in diameter, on which nothing is permitted to grow. This serves as a sort of parade and exercise ground. Around the clearing is a ring of luxuriant grass from three to twenty feet wide. On the seeds of this grass the insects subsist, planting it every spring and garnering the crop in the autumn. Across the rings which surround formicaries run turnpikes a few inches wide, connecting farm with farm for many furlongs.

In the region described there is practically no vegetation except the grasses cultivated by these ants. The latter appear to keep down and exterminate all other plants, such as cacti, greasewood and mesquite. The plants naturally prevailing in that part of the country are entirely absent from the most thickly settled farming districts. In short, these insects have developed an art of agriculture peculiar to themselves, have made conquest of the land for their needs and have artificialized certain cereals as thoroughly as maize and barley have been artificialized by man. "Thus," says Prof. McGee, "the rigorous environment of the desert has developed one of the most remarkable intelligences; and incidentally, an animal and a plant have come to be mutually dependent upon each other for existence." The favorite cultivated plant of these ants is the familiar buffalo grass.

Co-operation in Plants.—Although in some cases it is difficult to distinguish between true parasitism and symbiosis, says Mr. George Clayton, in a recent paper on this subject, and to pronounce definitely that the host plant does not get some advantage from the parasite that feeds upon its juices, yet innumerable cases are known in which the two plants in union mutually benefit each other, and the term applied to such unions would be symbiosis. Symbiosis may then be defined as the associated existence of two or more plants for purposes of nutrition.

Unlike parasites, two symbiotic plants living in union each supplies its partner with materials that the partner requires; a reciprocity system being the rule of their combined existence. Many of the forest trees, common shrubs, etc., have attached to their roots fungoid partners which, absorbing from the ground moisture and mineral matters, hand these chemicals over to the larger tree, receiving in return starch and other organic materials, which the tree has formed in its foliage. The black poplar and many other plants have the thread-like filaments of fungi woven over their roots.

In the first instance, the root which descends from the germinating seed into the ground becomes entangled with the myceloid filaments of the fungus already existing in the soil, thenceforward the connection continues until death. As the root grows onward the mycelium which invests it grows with it, accompanying it whatever direction the root may take.

The number of plants having symbiotic relations of the kind described is very large, most of the Ericaceæ, Coniferæ and Cupuliferæ co-operating with subterranean partners. It is notable that the chief species of flowering plants which are symbiotic are gregarious in character, and, like the oak, fir, heather, etc., form large forests, or moors, and one may be filled with wonder at the magnitude of the immense colonies of subterranean fungi which must exist interlacing themselves at the roots of such forests of trees.

It will also be plain why there is such a profusion of fungi of all kinds in forests and round the roots of certain trees. The lichen is now almost generally admitted to be of a composite character, each lichen being comprised of (1) a fungus made up of a web of myceloid threads with (2) an alga in its interior, the combination of alga and fungus thus forming the one lichen plant.

The myceloid threads of the fungus, being most exterior, fulfill the function of gathering from the air moisture, while its partner, the alga, owing to its having chlorophyl, manufactures starch and other chemicals; thus here, again, the partners supply each other with matter necessary for the life of both.

A most interesting proof of this union is afforded by the fact that a lichen may be actually synthesized by sowing certain algæ along with certain definite fungi in a favorable place, when the two separate plants amalgamate and interweave their cells, with the result that a lichen is formed.

### Sleepy Grass.

In some parts of New Mexico there grows a grass which produces a somniferous effect on the animals that graze upon it. Horses, after eating this grass, in nearly all cases sleep standing, while cows and sheep almost invariably lie down. It has occasionally happened that travelers have stopped to allow horses to feed in places where the grass grew pretty thickly, and the animals have had time to eat a considerable quantity before its effects manifested themselves. In such cases horses have gone to sleep on the road, and it is hard to arouse them.

The effect of the grass passes off in an hour or two, and no bad results have ever been noticed on account of it. Cattle on the ranches frequently come upon patches of this grass, where they feed for perhaps half an hour, and then fall asleep for an hour or more, when they wake up and start feeding again.

The programme is repeated perhaps a dozen times, until thirst obliges them to go to water. Whether, like the poppy, the grass contains opium, or whether its sleep-producing property is due to some other substance, has not been determined.—Pearson's Weekly.

Mr. Frederick V. Colvill, Botanist United States Department of Agriculture, says: "The so-called sleepy grass mentioned in a recent article in Pearson's Weekly is known technically as Stipa viridula robusta and is known from reliable persons to have a narcotic effect on horses and other stock."

IT is often supposed that boys in growing keep ahead of girls; but recent measurements disprove this. The boys, up to their eleventh year, were found to run about a quarter to half an inch taller than the girls. They were then overtaken by the girls, who surpassed them in height till their sixteenth year, when the boys again grew faster than the girls, and came to the front.

© 1895 SCIENTIFIC AMERICAN, INC.

## SUSPENDED RAILWAY SYSTEMS.

The subject of rapid transit is now attracting great attention in many of the large cities of the world, including Paris, Berlin, Boston and New York. Among recent projects for urban transportation is one in which the cars are suspended and the motive power is electricity. In this form of aerial railway a derailment would be practically impossible, the center of gravity being very low.

M. Langen has designed such a road for Berlin and other places, and the system is adapted both for ordinary rapid transit or for high speed service, for he considers that the enormous speed of 186 miles per hour may be attained. We give some illustrations of his design. Figs. 1 and 2 show an elevation and sectional view of the electric motor and its mode of attachment to the car. The derailment of the wheels is prevented by the friction plates. The wheels are secured to the motor case in the usual way and are supplied with springs to take up shocks. The car is fastened to the motor through the medium of a center pin, e, which permits of a certain amount of lateral play. The car is suspended by springs which render riding easy. Each truck has four wheels. Each car is provided with two motors as shown in Fig. 5. Each truck is also provided with brakes which seize the rail at both the top and bottom.

In addition to the invention of the passenger car, M. Langen has designed an inspection car, which is suspended in the same manner but has only one electric motor. On the other truck is a gas or petroleum motor which actuates the running gear if the supply of electricity fails. If the motors of the cars or the supply of electricity should fail, owing to a break in the line, the passengers can be conveyed to one of the cars of the other line. The expense of the new system is not as great as in most other schemes for aerial transportation. The cars make comparatively little noise and curves are passed with ease. The girders which support the tracks are constructed on the cantilever plan and are secured to columns, various styles of which have been devised to suit the conditions of the streets on which the railway is to be built, as a single column and double column support. Fig. 5 shows the trial line which has been erected at Deutz, which is across the Rhine from Cologne. Fig. 6 shows a design for the suspended electric railway intended for a crowded Berlin street. The cars seat fifty persons each and access to them is gained from stations which are built at convenient intervals. The current is supplied to the motors by three wires which are carefully insulated and protected from contact with other wires. The current is supplied on the well known block system, and if a car should be temporarily stopped between stations, there is no chance of the next car colliding, as no electricity is supplied to the block following the one where stoppage occurs until the car which has stopped has left the block. An electric brake is also automatically applied.

The first concession which has been given to the promoters of the Langen system has been granted by the cities of Elberfeld and Barmen. It is decided to build within a year an aerial line between the two cities. The contract was signed toward the end of the year 1894. For our engravings and the foregoing particulars we are indebted to the Revue Universelle.

Coming now nearer home, we will give a few particulars of the system proposed for New York City and vicinity by Mr. J. R. Hawkins, of Mountainville, N. Y. It is a very comprehensive plan, specially designed to meet and accommodate the great and rapidly increasing population of this metropolis. He designates it the Triplex Service Rapid Transit System. Suitable piers or towers are located at intervals, from which several independent tracks are supported on the suspension plan, and from trucks on these tracks the cars are suspended. The cars of the different tracks may run at different speeds. The lower line of cars is intended to accommodate the street travel, and the cars will be suspended, say 16 feet above the surface of the ground, suitable places with steps being provided where the cars stop for passengers. The inventor says: The passenger does not have to step in front of a passing vehicle, thus endangering life, does not have to wait for a vehicle to pass; and the car, when boarded, does not have to wait for any obstructing vehicle to pass or get out of its way while running, and is ready to proceed at once when boarded, and can continue its journey with unabated speed, until a passenger is ready to board or land, thus saving from ten to twenty per cent of time, besides the saving of time to all other traffic, by leaving the street almost entirely free for all other vehicles.

The three roads combined, of the suspended triplex system, can be built to carry twice the number of passengers that all the New York roads combined can at the present time accommodate, while the cost of construction will be comparatively small.

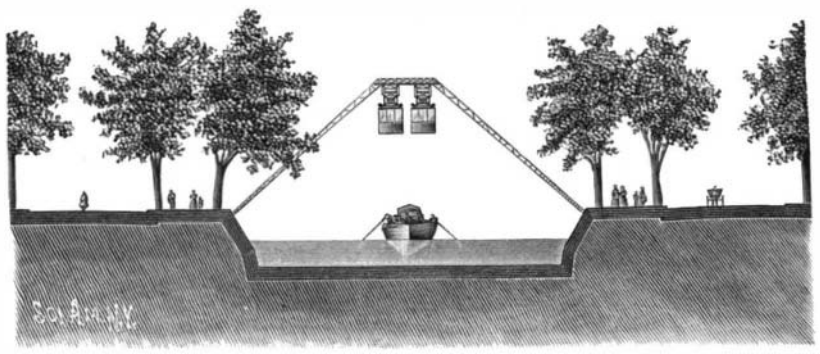


Fig. 3.—THE CARS SUSPENDED OVER A CANAL.

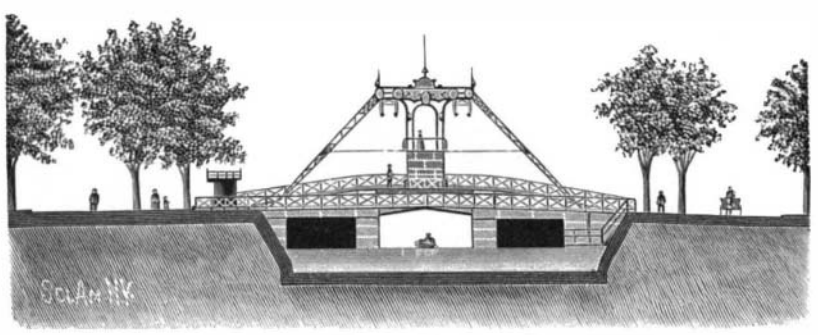
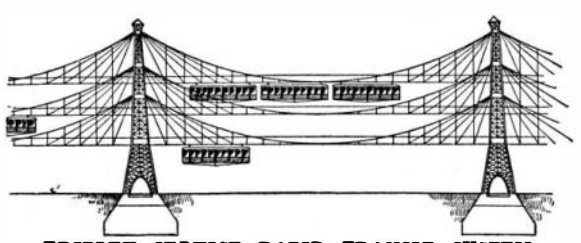
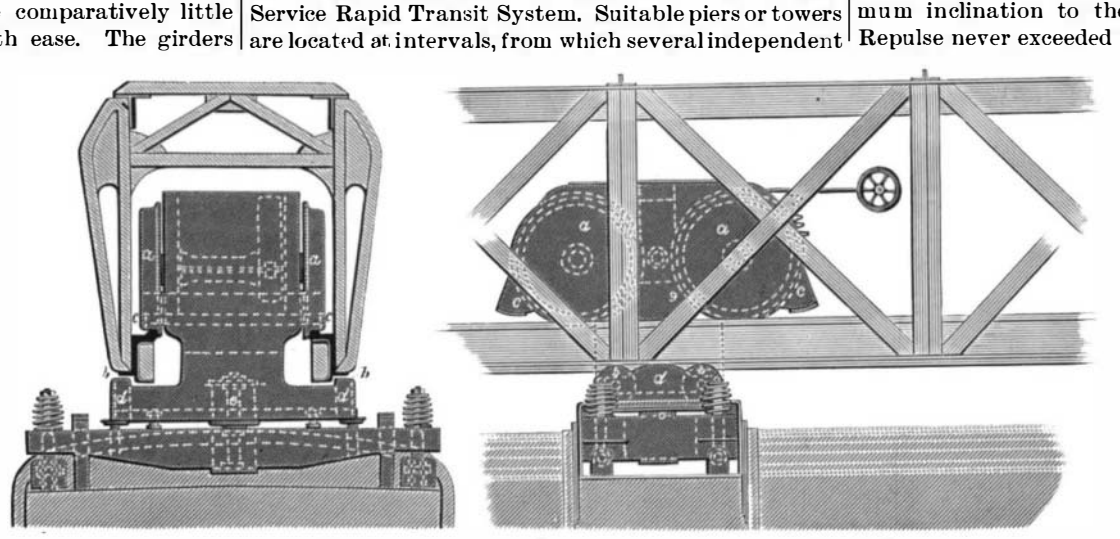


Fig. 4.—THE RAILWAY AT A FLOOD GATE.



TRIPLEX SERVICE RAPID TRANSIT SYSTEM.



Figs. 1 and 2.—ELEVATION AND SECTION OF THE ELECTRIC MOTOR.

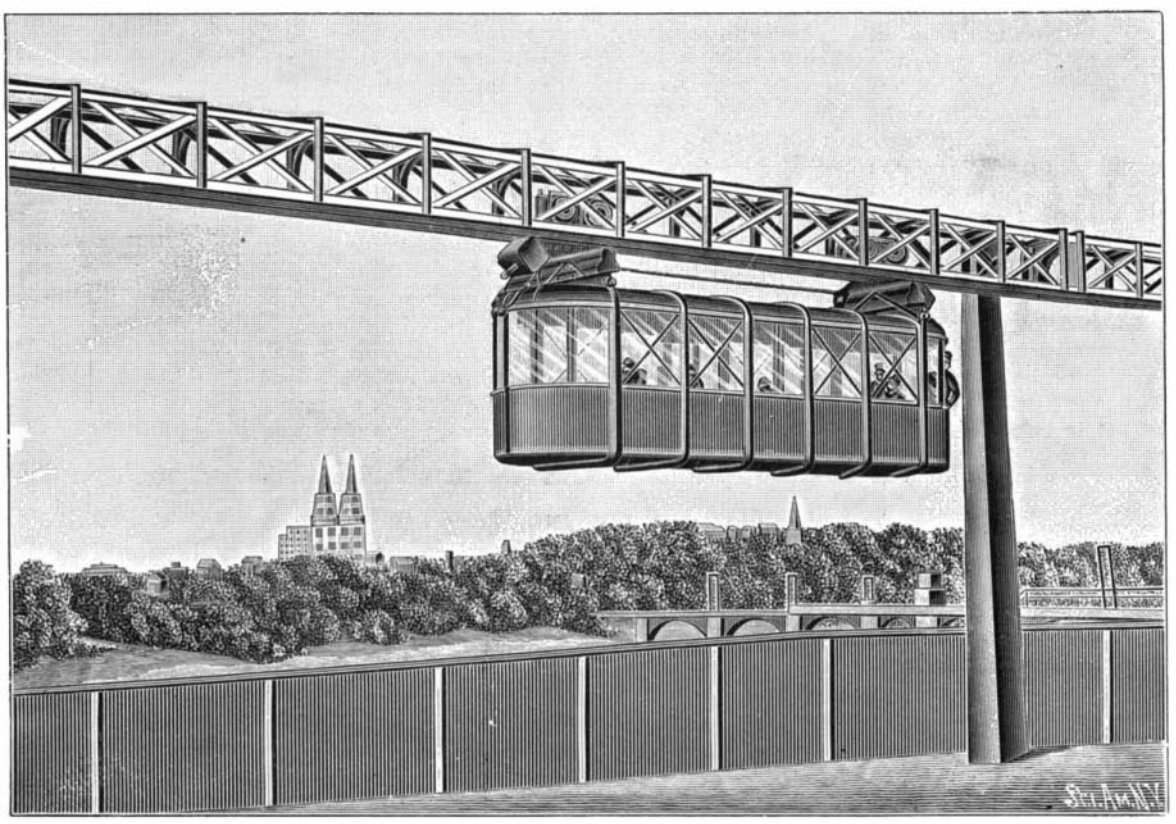


Fig. 5.—SUSPENDED ELECTRIC RAILWAY—TRIAL LINE AT DEUTZ, NEAR COLOGNE.

### Bilge Keels.

Sir William White, K.C.B., LL.D., the Director of Naval Construction, was the author of a paper entitled "Notes on Further Experience with First-class Battle Ships," which was read at the recent meeting of the Institution of Naval Architects. In the course of his paper, Sir William said that, as an experiment, the Repulse had been fitted with bilge keels, so that she might be tried in company with sister ships belonging to the Channel Squadron. These keels are about 200 feet in length and 3 feet deep.

The Resolution (without bilge keels), by orders from the Admiralty, had been purposely kept in very nearly the same condition of stability as the Repulse. Comparing the returns from these two ships, it appears that the Resolution on one occasion reached a maximum inclination to the vertical of 23°, whereas the Repulse never exceeded 11°. The mean angles of oscillation were, of course, considerably below these maxima—probably about one-half. The Royal Sovereign and Empress of India were also in company. The condition of coal stowage in these two ships at the time gave them greater stiffness and a quicker period, which, under the conditions of weather and sea, caused rather heavier rolling than in the Resolution. In view of this experience, although the trial was limited, and not representative of many conditions occurring at sea, it was decided to fit all the other ships of the class with bilge keels similar to those which had proved so effective in the Repulse. This work was completed for the ships of the Channel Squadron during their annual refit last summer. It has since been carried out in all the other ships of the class. On the cruises of the Channel Squadron which have taken place since bilge keels were fitted there have been but few opportunities of obtaining proof of their practical value. So far as experience has gone, however, there is a consensus of opinion among officers in command that rolling has been greatly reduced by the bilge keels.

As regards the influence of bilge keels on speed, the practical test of actual service proves that there is no sensible reduction in speed for power, or material increase in coal expenditure for a given speed, at a given draught, and with the bottom in similar condition.

A TEXAS hailstorm on April 24 made sieves of frame houses, blockaded the Great Northern Railroad, and killed large numbers of live stock. The hailstones are said to have been as large as hen's eggs.

© 1895 SCIENTIFIC AMERICAN, INC.

### English Locomotive Cabs.

Writing to Engineering (London) Mr. Clement E. Stretton severely criticises the English practice of depriving locomotive engineers of all shelter from the weather while engaged in the performance of their duties. He says:

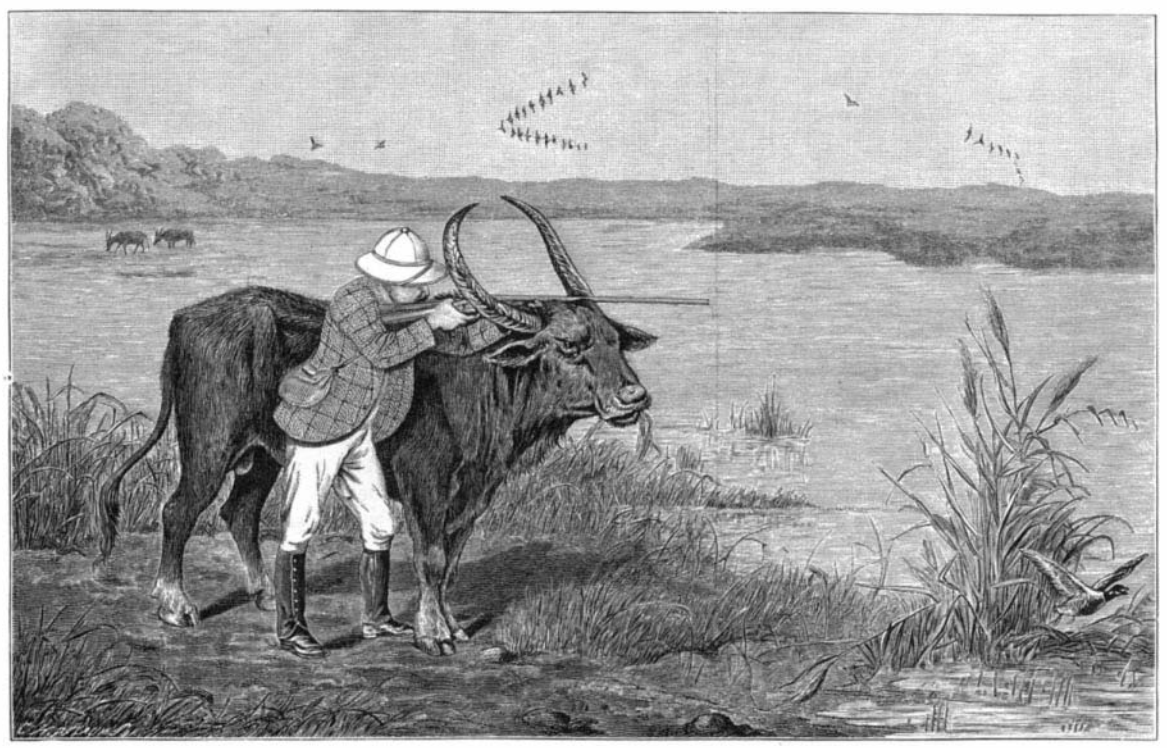
The recent collision at Binegar, which was caused by the driver and fireman trying to obtain shelter upon a bitterly cold night when running tender first, should be the means of obtaining far more protection for engine drivers than they at present have. Unfortunately several locomotive engineers appear to still hold the old opinion that "to provide a comfortable cab would render the men careless," and also add to the cost of the engine. The wishes and requests of the engine drivers and firemen to be provided with better cabs, and also that those engines which regularly are working tender first should be provided with weather boards upon the tenders, seem to receive very little attention, for nothing has at present been done to provide better protection to drivers generally.

Probably no greater difference in "cabs" can be seen than in the various engines working over the metropolitan lines, where the engines of one company will be found to have a complete "cab" and shelter provided for running in either direction, but the engines of another company have no covering whatever over the men. There is no possible reason why various engines, performing the same service, should be so differently constructed, nor is there any reason why the American engine driver should be able to perform his duties in comfort and yet that the same protection should be refused to the English driver.

Fig. 6.—PROJECT FOR AN ELECTRIC SUSPENDED RAILWAY FOR BERLIN.

### SPORTING OXEN AND BUFFALOES.

A correspondent of the Graphic, London, writes from India: Some years ago a friend of mine, known in the district as J. J., was manager and part owner of a Behar indigo factory. Being short of factory oxen, he purchased from some natives a number of buffaloes to work in the plow. Among this draught was a full grown bull which was of such a savage and morose disposition that the natives could do nothing with him — he would charge them again and again, and could only be approached by jamming the herd in a mass round him in the "Bail-Khana," or bullock house. J. J. was rather a good hand at breaking in "Cutcha" horses; the fancy took him to try and tame the bull buffalo. So he told his "jemadah" to have the animal securely fastened in the shade of a large pepul tree which grew in the compound in front of his bungalow veranda. Then he forbade any of the servants to go near, and took the entire charge of the "bisa" himself. For a long time he fed him very sparingly, and whenever he was passing the pepul tree he would go near and talk to the bull in a full deep voice; sometimes using very flowery Hindostani, in which he made frequent allusions of a defamatory character to bull buffaloes in general and the direct ancestors of this one in particular. These remarks were often emphasized by recourse to a rather heavy bamboo "lathi" which was kept handy. The animal would charge J. J. in the most savage manner, but as he was securely fastened to the tree, and his trainer took good care to keep some little distance beyond the end of his tether, these onslaughts were of little avail. Moreover, they were always met by a sharp crack on the nose by the aforesaid bamboo. Soon the "bisa" began to awaken to the folly of this mode of procedure, and contented himself with merely shaking and tossing his head. Then J.J. took up the attack, walking round and round the tree, shouting loudly and calling Mr. "Bisa" all kinds of names! After this some canes of the succulent sugar plant were introduced, and the poor beast, being in a very low condition, soon learned to take them out of his master's hand, though showing some shyness at first. In course of time he would allow himself to be patted, and eventually became so tame and fond of his master as to leave the herd and come up to the veranda when called, and receive scraps from the table as his reward. Of course he had to do his daily task on the cultivation, but showing himself still uncertain with the native plowmen, the planter devised the plan of utilizing him as an ambush for wild duck shooting, these birds being quite accustomed to the herds of village buffalo which graze along the margins of the jhils and lagoons. After some practice this bull became very steady under fire and enabled his master to make some big bags.



A SPORTING BUFFALO.

A correspondent of the N. Y. Sun says: "I made a good deal of money in the early days of California, when we used to stalk wild geese with oxen. Stalking geese with oxen may sound a little queer, but that's the way we used to hunt 'em in the early days. A good stalking ox, I want to tell you, was a valuable bit of property forty years ago in California, and we used to talk about him and discuss his points just about the same as sportsmen nowadays discuss the points of their bird dogs. A good stalking ox could earn his owner anywhere from $50 to $100 a day if the owner himself was any good, and enjoyed the sport as much as the hunter did.

"I went to California in 1851, and promptly dropped every cent I had in a gold mine venture. In all the counties bordering on the bay, and in fact all along the coast, wild geese occupied the wide and open plains by the hundreds of thousands. I have seen more than a thousand acres of these big fowl pasturing in a solid block, and that many cattle feeding couldn't have cleared the grass away as completely as those geese did. I heard that the killing of these geese for market had grown to be a great industry, and that some men were getting rich at it. Ranchers were also offering a bounty for the geese, as cattle raising was becoming an important business, and the geese preempted so much of the pasture area that the loss was serious to the cattle men. I scraped enough money together to buy a gun, and abandoned gold mining for goose hunting.

"When hunting for wild geese on those plains first began, the hunters were able to crawl up on them as they fed and get within easy gunshot. But the geese soon got on to the sportsmen, and by and by no one could get within half a mile of a flock. Hiding in grass blinds was tried and worked well for a time, but the cunning geese sized the blinds up at last and wouldn't come anywhere near a bunch of grass. So something had to be done. Some one had noticed that cattle feeding on the plains could crop the grass almost on the heels of a host of geese, and the fowls took no notice of them. He had an ox that was even tempered and accommodating, and one day he turned it loose and let it feed along toward where a tremendous flock of geese were pasturing. Now and then he'd hurry the ox up a little, walking close to it on the side away from the geese. By and by the ox got close enough to the geese to satisfy his owner, who stood still until the ox had passed on out of the way. Then he emptied one barrel of his gun into the flock on the ground and gave it the other as the birds rose. He picked up sixty-two geese. The ox was somewhat surprised, but didn't object to repeating the operation next day, when it was equally successful. Geese were worth a dollar apiece. That was the origin of stalking wild geese with oxen. In less than a month there wasn't a goose hunter along the coast who didn't have a goose-stalking ox."

### The Toothpick Industry.

Insignificant articles like the toothpick represent the investment of millions of capital, the employment of skilled labor, utilization of the latest inventions, the consumption of vast quantities of wood, and the operation of a long line of complex activities. These small articles play an important part in the economies of all civilized nations. To stop at once the manufacture of toys and all not really needful articles in these nations would be to put a stop to a large part of the working and producing forces that constitute the origin of civilization. Some European nations live mainly by their work on articles that are really only mere toys and playthings. In the United States we are rapidly adding to our productions all the wares that find favor abroad, while we have originated scores of novelties in the amusement line that are being sold and imitated abroad. There is in humanity a chord that responds to the touch of frivolity, adds the American Wood Worker, and that chord has enabled the inventors of ingenious nothings to coin fortunes out of their trifles.

THE eastern hemisphere, on which dwell 92 per cent of the population of the world, has 170,792 miles of railroad, or 46 per cent of all railroads.

© 1895 SCIENTIFIC AMERICAN, INC.

### Shop Photography.

James F. Hobart tells, in the Iron Age, how to select the necessary apparatus, the material, and how to do the work of photographing machinery and other goods.

Photography has become so necessary to the manufacturer that he can no more do without it than he can dispense with the draughtsmen who design his tools and machinery or the salesmen who turn the manufactured products into cash. Notwithstanding that photography is so valuable, the manufacturer has not employed it to the extent he might, and by all but a few concerns photographing is done in a loose, haphazard manner, sometimes by one and sometimes by another "photographer to the trade," who may chance to be available at the time pictures are needed. As a result, there is not even a ghost of a system in the preparation of pictures or in the sizes used. Neither are they got out always at the time and in quantities to suit the man who pays for them. Another thing is the ownership of the negatives. The photographer claims them, and as he has got them, and possession is said to be nine points of the law, he generally keeps them and makes the manufacturer await his pleasure. Indeed, it has been stated that the only way to get a negative away from a photographer is "with a club," and there seems to be a good deal of truth in the statement.

Once equipped with the required apparatus, the necessary material and "know how," photographs can be turned out at will, and usually in a small fraction of the time required by professional photographers to deliver the same amount of work. This is not because the shop operator can do work quicker than the professional, but because he has only one man's work to look after, instead of having to cater to twenty or thirty customers at once, when, perhaps, all of them want their work first, and "day before yesterday" at that.

The apparatus and material that should be purchased to begin with need not cost more than $100, although as the operator gets into the business he will become acquainted with many "conveniences and luxuries" which he will want, and which will bring the cost to a somewhat higher figure. To begin with, purchase a camera, tripod and lens, one or two double dry plate holders and a focusing cloth. These comprise the articles necessary for exposing the plates. For developing the negatives there must be provided three trays, at least 10 × 12 inches, a glass graduate for measuring the developer and two or three bottles in which to keep the developing solutions.

For making pictures from the negatives there will be needed two "printing frames," three trays, and another bottle or two. For the trays, those used for the negative developing can be used, but it is better to get one large tray, at least 15 × 19 inches, for toning prints, to be kept for that purpose exclusively. When it comes to mounting the prints on cardboard, there will be needed only a soft bristle paste brush, although some of the luxuries of the art will probably soon be obtained, consisting of glass forms for trimming the prints and a burnisher for finishing up the pictures after they are mounted. This operation (burnishing) is a very important one, but a burnisher is expensive, costing about $25, and in all large towns there are dealers in photographic material who will burnish prints at a small cost.

The camera should not be less than 10 × 12 inches in size, and a picture of that area will be large enough to show up any ordinary machine. A good 10 × 12 camera can be purchased for $25. It should have a rising front and swing back. The rising front enables the operator to throw the image a little more toward the top or the bottom of the plate, thus making a change in height without moving the camera itself. The swing back is to keep the perpendicular lines of the machine vertical on the picture. It is often desirable to tilt the camera up or down a little, or even considerably, in order to get the whole of a tall machine on the plate, or, perhaps, to show the top as well as two sides. This can be done, but the plate which is to form the negative is tilted so that the picture of the object appears wedge shaped.

Perhaps one of the best illustrations of the use of the swing back that can be made is to set up a plain board, say 16 feet long. Erect this board on one end, then set up the camera in front of it and tilt the machine so that the top of the board is visible on the ground glass. A close inspection of the image will show that the top is very much narrower than the bottom, making a wedge-shaped picture, which is far from being a correct representation of the object itself. In order to correct this error, the swing back must be used, and so changed that the ground glass will stand perpendicular. Then, no matter how much the camera itself may be out of level, the picture will be perfectly symmetrical in all its parts, provided the lens is rectilinear, as it should be. The glasses must be so proportioned that pictures of all objects are not distorted by being reduced more or less to a circular form, as is the case with some of the cheap view lenses in the market. A very good test for a lens is to draw a large square on a piece of paper or board, then set up the camera so that the image of the figure almost covers the ground glass. Then, with a nice straight edge, test the lines on the ground glass. If they are perfectly straight, the lens is rectilinear. If the lines are not straight and the figure as perfect a square as the one in the drawing, then the lens must be discarded for a better one.

A good lens for photographing machinery can be purchased for $35. It will cover an 8 × 10 plate in good shape. Two kinds of lenses are made, one kind being known as "wide angle," that is, it will put into the picture anything coming within an angle of 90° to 100°. The ordinary lens will not take in more than 50° or 60°, and this kind is much better for making pictures of machinery, because the perspective of a machine is not made so prominent with a narrow as with a wide angle lens. In cases where the room in which a picture has to be taken is limited, as when photographing a large machine in a small room, the wide angle lens is a necessity. If expense is no object and the shop is to purchase a first-class photographic outfit, then both a wide angle and an ordinary lens should by all means be included in the list and both made to fit the same flange on the camera. For the $100 limit we must be content with a single lens, and that is one covering not more than 60°.

The developing trays are next to be selected, and if there is a handy pattern maker in the shop, he can save that item of expense by making some neat pine frames of the size required for the trays, and then setting a pane of glass in a rabbet made for that purpose inside each frame. The glass must be set with shellac or asphaltum varnish, and the entire frame should also be given several coats of the same substance. This method makes trays with transparent bottoms, and they are nice ones to work with. Some concerns use wooden trays with wooden bottoms as well. They are good when large sizes are necessary.

The cost of the articles necessary is about as follows:

| | |
|---|---|
| Camera and tripod | $25.00 |
| Lens | 35.00 |
| Three 9×11 trays, at $1.65 | 4.95 |
| Two 8×10 plate holders | 8.00 |
| Focusing cloth | 50 |
| 8-ounce glass graduate | 50 |
| Two 8×10 printing frames | 1.00 |
| One large tray, 15×19, for toning | 4.00 |
| One 2-quart fluted glass funnel | 70 |
| One 3-inch brush for pasting prints | 50 |
| One 3-inch camel's hair brush for dusting plates | 50 |
| One box (one doz.) dry plates, 8×10 | 2.40 |
| 1 ounce pyrogallic acid | 45 |
| 1 pound carbonate of soda (sal soda) | 10 |
| 1 pound sulphite of soda | 45 |
| 5 pounds hyposulphite of soda | 35 |
| 1 pound ground alum | 10 |
| 1 ounce sulphuric acid | 12 |
| 15 grains chloride of gold | 60 |
| 1 pound chloride of sodium (common table salt) | 4 |
| 8 ounces nitrate of silver in crystals | 6.00 |
| One package round filter paper, 13-inch | 55 |
| 100 negative envelopes | 75 |
| One dozen sheets albumen paper | 1.00 |
| One dozen sheets, 8×10, ferro-prussiate paper | 45 |
| One quire non-actinic orange paper | 50 |
| 100 card mounts, 10×12 | 2.75 |
| One quart parlor paste | 50 |
| Total | $97.76 |

This estimate comes within the $100, and by the time the first picture has been made the balance of $2.24 will be found in demand for little things of convenience in the dark room.

### Unsolicited Testimonials.

We have received a large number of unsolicited testimonials for our "Scientific American Cyclopedia of Receipts, Notes and Queries," of which the following form a part. Professor Edward S. Holden, of the Lick Observatory, says: "It is a mine of useful information set forth in a simple manner, and it will be found of value to all who have to do with practical matters—as who has not, nowadays?" Mr George F. Kunz, the gem expert, says: "'The Scientific American Cyclopedia of Receipts' cannot fail to be highly valuable to artisans of all kinds, such as jewelers, silversmiths, microscopists, and many others who are desirous of obtaining recipes for making, repairing and adjusting a great variety of articles with which they are constantly coming in contact." Professor W. F. Watson, of Furman University, says: "It exceeds my expectations. I believe it to be the most comprehensive and reliable work of its kind that has ever been published." Robert Bond, M.D., says: "It pleases me to say that no other book I have would I exchange for it could I not duplicate it. I have used several of the formulas and have had absolutely no failures when I use pure materials. Being a chemist, of course I know how to select. In fact, some of your formulas are marvelous." The Rev. C. C. Brown says: "Your 'Cyclopedia of Receipts' is a wonderful book. I reinked the ribbon that I am now using by following the directions given in the book; I have also made a splendid hektograph and a supply of ink." Mr. M. E. Lee says: "I am so captivated with your 'Cyclopedia of Receipts, Notes and Queries,' that I desire another for a new year's present to a friend of mine and inclose $5, for which please send me," etc. Mr. A. E. Dye says: "Cyclopedia received. Am delighted with it. Just what I have felt the keenest want of for years." Mr. Charles E. Cole says: "I think it is the finest thing of the kind I ever saw. May its sale never stop until every family in the civilized countries of the world has got a copy."

### The De Mare Incandescent Gas Burner.

Public attention is being given in Paris to a system of incandescent gas lighting to which the name of the inventor, M. De Mare, has been given. The arrangement consists of an atmospheric burner-fitting designed to be easily attached to an ordinary burner point. This fitting is of extremely ingenious design and construction; being probably the smallest and most compact air and gas mixing apparatus ever successfully used for this purpose. It is professedly designed upon the principle of the Giffard injector. The mixed gas and air issue at the top of the fitting through a slit, which causes the flame to spread in the regular batswing shape. Across the flame is suspended, by means of a brass yoke, a length of twisted platinum wires, carrying a row of what appear to be asbestos fibers. In the heat of the atmospheric flame these fibers become highly incandescent, and yield a brilliant light. The effect is certainly striking; and as neither chimney nor globe is required to enable the light to burn satisfactorily, and the incandescing material is not woven into any textile form, the simplicity and cheapness of the arrangement are obvious. For street lighting, clusters of these burners are used in Paris with good effect. Before lighting, the fibers, being flexible, will stand any reasonable amount of handling; and it is said that one string will last for 1,500 hours of lighting, and be serviceable to the last shred. The consumption of gas in the De Mare burners is limited to 2⅜ cubic feet per hour; and the illuminating power is stated to be 25 candles.

### Photographs of Lightning.

Mr. J. N. Jennings, of Philadelphia, and of the Philadelphia Photographic Society, gave an interesting exhibition of views of lightning before the Society of Amateur Photographers, in this city, on the 14th inst., which proved, in his estimation, that the artists' conception of lightning, as depicted by them, was wholly wrong. He had illustrations of the earliest ideas of lightning gathered from the records of the ancients; lightning as the Western Indians sketched it; a comparison of the discharge of electricity over the surface of a dry plate, between the two terminals of a Holtz electrical machine, with the appearance of iron filings on a piece of glass or paper as arranged between the two poles of a magnet when the latter is placed under the paper, and a comparison of a heavy discharge spark from such machine with an ordinary lightning flash. A photograph of a silver dollar laid on the surface of a dry plate and illuminated by the faint discharge of electricity about it was very novel.

Other pictures represented the curious tree-like appearance of lightning, and the dark branches or black branches seen to emanate from the side of the stroke. Mr. Jennings stated that when the picture was made he observed, at the time of the flash, these branches had the appearance of a deep orange color, which accounts for the phenomenon of their taking black on the sensitive plate. A peculiar phase of a single flash, separating into two branches going in the same direction downward, the path of one being further off than the other, on account of the lateral action of the wind, was shown. There were views of veritable thunderbolts, where two separate flashes run into each other. Also views of flashes shooting upward from the earth. He showed a comparison between a sheet of glass cracked by heat with the form of a lightning flash, and closed the series by showing a view of a flash taken from the rear end of a railway train in motion, which had the appearance of a broad ribbon of light—very remarkable. He proved that it could not have been due to the local movement of the camera, but gave as a possible explanation that it might have been produced because of a single stroke separating it into two parallel branches near together, one nearly back of the other, which would make the light from each merge on the plate and give the effect of a broad ribbon of light.

The views were very instructive, in showing the many phases of lightning and in correcting false ideas on the subject. Photographers generally should be prepared to catch views of lightning, in order that it may be studied photographically as effectively as astronomy is now done.

### The Deseret Museum.

In our description of the Deseret Museum, Salt Lake City, in the SCIENTIFIC AMERICAN of April 20, the size of the main lecture hall was erroneously given as 16 by 32 instead of 66 by 32 feet, as it should have read. The museum was represented by its president, Dr. James E. Talmage, at the Dublin meeting of the Museums Association in June of last year.

© 1895 SCIENTIFIC AMERICAN, INC.

### Columbia College Library.

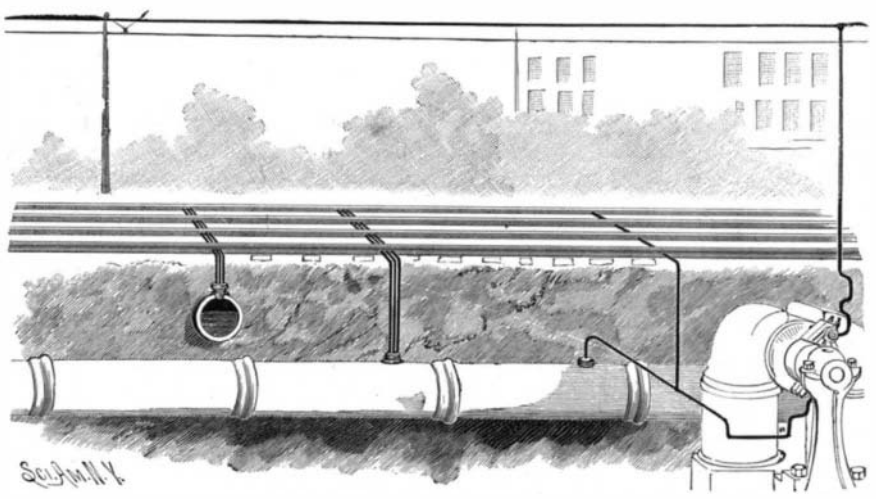
President Seth Low, of Columbia College, New York City, has given one million dollars to build the new library building, which will be erected on the new site of the college at One Hundred and Sixteenth Street, New York. Mr. Low wishes the library building to be a memorial to his father, the late A. A. Low, "a merchant who taught his son to value the things for which Columbia College stands." The new library will be erected in the center of a terrace occupying the highest point of land of the new site and will be the center of the imposing group of buildings. Access to the facade of the new building will be gained by a flight of steps 325 feet wide, which lead to a subordinate flight 140 feet wide, which, in turn, lead to the main terrace on which the library building will be erected. The classic building will be in the form of a Greek cross, and will be surmounted by a dome at the intersection of the arms. The summit of the dome will be 136 feet above the upper terrace. Bronze doors will give entrance to the portico, from which the richly ornamented vestibule will be reached. Marble doorways will lead thence to the president's room and the office, on the left and right respectively, while directly ahead the vestibule will open into the main reading room, which will occupy the whole space beneath the dome, which will be 70 feet in diameter. From the four piers of limestone at the corners will rise four richly coffered vaults, which correspond to the four arms of the building. These vaults will be 17 feet deep and will end in semicircular windows, 44 feet wide and 22 feet high. A marble and bronze colonnade, 29 feet high, will connect the piers and support a gallery adorned with statues of heroic size beneath the great windows and at the level of the second story. The colonnade gives access to an ambulatory surrounding the reading room, and thence to the halls and special libraries occupying the four wings of the building, also to the four stone staircases leading to the upper stories. The northern arm of the library is set apart for the law library, the western for the administration, the eastern for the Avery architectural library, while the southern is occupied by the vestibule and adjoining chambers before mentioned.

The second story contains the trustees' room, the president's private room, special libraries, etc. The third story will be devoted to lecture rooms, of which there will be ten, and to rooms for officers of the college. The main depository for books will be situated in the basement of the building, which is entirely above ground. The design of the library has been prepared by Messrs McKim, Mead & White. It will be constructed of buff Indiana limestone.

The library of Columbia College is one of the most remarkable collections in the country, the number of volumes in 1893 exceeding 160,000. Though primarily intended for the use of the students, a generous hospitality is extended to scholars or to any one who is making special investigations.

### PROTECTING THE PIPES NEAR ELECTRIC RAILWAYS FROM ELECTROLYTIC ACTION.

Since the general introduction of trolley roads in the streets of towns and cities, numerous cases have occurred of damage to water, gas, and other pipes from the fact that the ground has become charged with electricity, and an electrolytic action thus set up by the escaping current, quickly destroying the pipes within its influence. To obviate this difficulty the improvement represented in the accompanying illustration has been patented by Mr. Richard Watkins, of No. 1909 M Street, Sacramento, California. The current is supplied by the generator to the trolley line in the usual way, and the generator is also connected with the rails and with the pipes in the street, these pipes being connected with the rails at frequent intervals and at points where the connection may be most easily made. The conductors should be large, so that the current will flow easily, and they are brazed or otherwise firmly secured to the rails to make good contact, while connection with the pipe is preferably made by means of a plug screwed into the pipe, but without the use of lead, solder being applied to make sure of a tight joint. By thus utilizing the street pipes for return conductors the current passes freely back to the generator and there is no chance for electrolytic action.



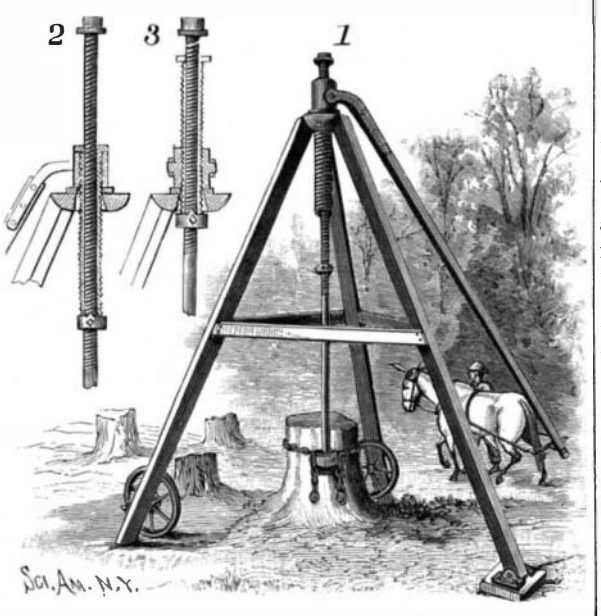
WATKINS' METHOD OF PREVENTING ELECTROLYSIS OF STREET PIPES.

### Solid Stream Forms.

Mr. D. W. Taylor, United States Naval Constructor, the gold medalist, read a paper recently before the Institution of Naval Architects, in amplification of that read a year ago on "Solid Stream Forms, and the Depth of Water Necessary to Avoid Abnormal Resistance of Ships." There was plenty of experience, he said, to establish the fact that in water only three times the draught of a ship the progress of that ship was materially retarded, but he was unable to discover any authentic case of retardation where the depth of water was six times the draught amidships. Very broad ships required a slightly greater draught than ships of ordinary proportion, while the greater the speed, the more need for great depth. This was because shoal water produced but little effect upon any but the wave resistance, and at slow speed the wave resistance was very small. It, however, increased with the speed. In the case of a very fast ship, the wave resistance might well be 10 per cent of the total resistance at 10 knots, and be 60 per cent or more of the total at 21 or 22 knots. An increase of one-fifth in the wave resistance would mean but 2 per cent at 10 knots, while an increase of one-fifth in the wave resistance at the high speed would mean an increase of 12 per cent in the retarding influences; and this, of course, means an increase of engine power.

### A SIMPLE AND EFFECTIVE STUMP PULLER.

The tripod frame of this stump puller has two of its legs provided with wheels, to facilitate moving it about, and to the third leg is swiveled a shoe, the head block at the top being preferably of metal, and having a conical opening, a half round washer resting on the block above the opening. The improvement has been patented by Mr. James D. Wilson, of Montague, Mich. Secured in any suitable way to the stump is a lifting shaft at whose upper end is a cap, the shaft having an exterior thread, preferably of two and a quarter inch pitch, and an adjustable clutch on the shaft, below the head block, is adapted for locking engagement with the lower end of a hollow shaft through which the lifting shaft passes. The interior of the hollow shaft has a thread engaging that of the lifting shaft, and the hollow shaft has a flange at its upper end and an exterior thread, preferably of four and a half inch pitch, the hollow and the lifting shafts being shown in their normal position in Fig. 1. A nut resting on the washer receives the exterior thread of the hollow shaft, the shape of the washer and of the head block permitting the lifting shaft to be somewhat inclined without becoming cramped. Arms projecting from the nut are secured to a lever or sweep to which a draught animal is attached, the lifting shaft moving up at a speed corresponding to the pitch of its screw thread, as the sweep is carried around, but when the clutch on the lifting shaft engages with the hollow shaft the latter is also carried up with the main shaft, at a correspondingly greater speed, owing to its coarser pitch, the stump then being raised four and a half inches at each revolution of the sweep. In Fig. 2 the lifting shaft is shown drawn up to a connection with the auxiliary shaft, and in Fig. 3 the two shafts are shown elevated together. As will be seen, the stump is first started and slowly drawn up by the main shaft, and is afterward raised more rapidly by the coarser thread on the auxiliary shaft.




WILSON'S STUMP PULLER.

### Improved Boat-lowering Devices Needed.

Commander Tupper, of the Royal Navy, in a recent number of the Nautical Magazine, makes the following suggestions:

What are the means of hoisting out boats? Simply by the use of curved davits secured to the ship's side and capable of swinging outboard, as may be required, if the vessel is on an even keel; if the vessel is not on an even keel, it is with considerable difficulty, and much shoving with spars, etc., on the davit heads, that the davits on the side with "heel from" can be turned out, and of course this difficulty increases with the angle of heel. Again, assuming that the davits have been placed in the outboard position, then comes the difficulty of lowering the boats and disengaging them without bilging the boat against the ship's side or capsizing her in the act of disengaging; with the lee boats this difficulty is minimized, but with the weather boats it is always a very serious matter. It therefore amounts to this, that in cases of collision and grounding, when the boats are most wanted quickly, it is more than probable that only half the complement of boats can be got out at all.

How can these defects be remedied? I. By improving the form of davits. II. By fitting the davits with jackstays from the commencement of the curved part to the water line, fitting runners on these jackstays and securing them to the lower blocks of the boat's falls, which should disengage from the slings directly the boat becomes waterborne.

As to I. Improvements in the form of davit. I may mention: (a) That in the Royal Navy some davits are fitted with a horizontal toothrack into which a worm works; that is, cogs are fitted round the stem of the davit and a spiral screw fitted on the gunwale; this screw is revolved by a handle, and working in the cogs causes the davit to revolve in any required direction. It is a most convenient arrangement and would enable davits to be turned outboard on the side with heel from, when other means could not be effectively used. (b) I have seen a form of davit in use in the American navy which has rather taken my fancy; the davits are straight bars of iron or steel; their lower ends are T shaped and rest in eye bolts close to the waterline, their upper ends carry the upper purchase blocks of the boat's falls in such a manner that the boat is slung from the stem and stern posts, and swings in between the two davits, the tumblehome of the ship's side giving sufficient angle for the keel of the boat to rest on the gunwale of the ship, and be secured there or transported from there to amidships on a trolley if more convenient. Now with this form of davit you could always get a boat out by forcing the davits away from the ship's side by screw or hydraulic jacks, and when the boat is hanging over the water you can lower davits and boat together, keeping the boat close up to the davit head until there is no chance of her being stove against the ship's side when the falls are lowered.

(c) Another and a very good form is a curved davit pivoted and hinged on the gunwale itself, having a permanent screw jack fitted to it. In this case, when the boat is hoisted and the screws are close home, the boat rests in the curves of the davits well inside the gunwale, and when the screws are out to the full extent the boat is suspended over the water well clear of the ship's side.

In both (a) and (c) jackstays could easily be fitted; in (b) they are not necessary, but could be fitted to the davits themselves from the heads to water line. All these forms are, to my mind, much superior to the usual boat's davit.

But in addition to more efficient davits surely every well found mail steamer should carry a large kind of unsinkable boat, something after the style of the old troop boat carried in some of our troop ships, which could be launched from whichever happened to be the leeside, and also capable of automatically disengaging itself and floating if the ship sank before there was time to launch the boat.

Again, it seems practicable so to construct the bridges and promenade decks that they should automatically disengage to form three, four, or more rafts which would be left floating when the vessel has subsided. Shrouds, backstays, etc., interfered considerably with the chances of floating such rafts formerly; but now that we no longer require more than one mast, which could be fitted as a tripod mast, and that the funnel guys are quite easily slipped, I do not see that anything need interfere with these rafts floating. If the passengers accommodated themselves on them, they might at any rate have a chance of being rescued. Small depots of water and provisions could always be kept filled, which might enable the occupants to preserve their lives for three or four days, when they would almost certainly be found, even in midocean.

© 1895 SCIENTIFIC AMERICAN, INC.

## RECENTLY PATENTED INVENTIONS.

### Engineering.

BEATING ENGINE.—William H. Ethell, Dayton, Ohio. This is a paper-making machine for thoroughly and unformly beating the stock to a proper consistency in a very short time. The tank has a midfeather forming two compartments, one with a channel at or near the middle of the bottom, and beating rollers are secured in a shaft journaled in the tank on opposite sides of the midfeather, one of the beating rollers being located above the channel. Bed plates are arranged under the beating rollers, and a back plate is arranged in front of the roller located over the channel, while a second back fall is arranged in the rear of the other roller.

BOILER.—Thomas A. Myers, Mendon, N. Y. This improvement comprises a front and rear head made ring-shaped and connected with each other by pipes, while an inner head is arranged within and connected with some of the pipes, and it is located a suitable distance from the front head to form a fire box with the latter, the inner head being provided with pipes extending into the opening of the rear head. A steam drum arranged above is connected with all the pipes. The shell is preferably made of alternate layers of sheet metal, asbestos, and wire netting, so that all the heat generated will be retained to heat the water passing through the pipes.

HORIZONTAL COKE OVEN.—Franz J. Collin, Dortmund, Germany. This improvement is designed to facilitate a very hot working of the ovens, rendering it possible to coke bituminous coal and coal containing small quantities of gas and incapable of satisfactory baking. The oven comprises a series of juxtaposed horizontal chambers or ovens in which the passages for the gas and the heating channels are so arranged that the escaping gases can be used for heating the boilers, and the extraction of products can be effected in the most simple manner. The arrangement is such that a freshly charged oven is heated by the heat evolved in an adjacent oven, the two adjacent ovens being never emptied in immediate succession, and the production of gas and coke being continuous.

CAISSON FOR SHIPS.—Costello N. Holford, Washington, D. C. According to this improvement the hull of the vessel is provided with rows of screw bolts extending from the keel to the water line, to which may be secured detachable ribs having a contour to snugly fit the vertical sides of the vessel, a horizontal rib joining the vertical ribs at the keel, while means are provided for detachably connecting a cap plate or housing. It is designed by this means to render the whole of the hull, from the keel to the water line, accessible in separate sections, for cleaning, repainting, or repairing without necessitating the putting of the ship into dry dock.

MARINE VESSEL.—Sebastien Lacavalerie, Caracas, Venezuela. This is a vessel adapted to be propelled either on or beneath the surface of the water. It is cigar-shaped, and at its bow end terminates in a small cone and at its stern in a larger cone, both cones being independent of the body portion, and the stern cone forming a compartment large enough to contain rudder-working apparatus and afford a lookout. The propeller comprises a series of spiral flanges and their supporting rings encircling and extending the full length of the hull, the rings serving as braces and turning loosely on the hull, and the driving shaft being arranged longitudinally in the bow of the vessel, with a head at its forward end to retain it in the bow cone. The vessel is provided with air tanks in which air is held under pressure for breathing purposes when the vessel is submerged.

### Railway Appliances.

CAR FENDER.—Robert Thomson, Brooklyn, N. Y. This is an improvement upon a formerly patented invention of the same inventor of a fender with an elastic cushion at the front, and covered with a yielding netting, the frame being hung from standards detachably connected with the end of the car. The improvement provides for the fender being conveniently slid on the car, either beneath the body or the platform, and being automatically locked when adjusted. A portion of the yielding covering of the fender frame is also so constructed that it may be folded flat on the main portion of the covering or be elevated to act as a guard to prevent a falling body passing rearwardly over it, the buffer cushion being also of novel character, durable, and inexpensive to produce.

CAR FENDER.—Otto A. Wicke and Philip Reinhart, Brooklyn, N. Y. According to this improvement there are parallel brackets beneath the car and eyes suspended from its front end, a sliding fender having turned-up braces sliding on the brackets, and brackets on the fender top engaging the eyes. The device is easily applied to an ordinary car, and may be readily pushed back beneath the car or extended forward ready for use, when it will trip and catch a person on the track in front of the car. A soft spring buffer covers the dashboard, preventing any injury to a person caught by the fender.

STATION INDICATOR.—William F. Prendergast, New York City. Two movable aprons are, according to this invention, adapted to display the name of the same station at opposite faces of a casing fastened in the middle of a car, so that it will be conveniently visible from all parts of the car, the aprons being moved by sets of drums geared together and intermediate mechanism, on the turning of a crank arm by one of the trainmen. The names of all the stations on the route are printed in order on both aprons, and they are thus shifted simultaneously while traveling in a forward direction, and simultaneously turned backward as the train travels in a reverse direction over the route.

DUMPING CAR.—Mexico Van Pelt, Moundsville, West Va. This car has a tilting platform which may be readily pushed to either side, to dump the dirt or other material on one or the other side of the track, without necessitating the uncoupling of the cars. The lower platform has stops at the edges and transverse vertical guides, while the upper platform has a transverse sliding connection with the main platform and pendent transverse guide members adapted to engage the guides in the main platform, stay chain devices connecting the platforms.

### Mining, Etc.

CONCENTRATING ORES.—Walter J. Hammond, London, England, and John Gordon, Rio Janeiro, Brazil. This is an improvement on a formerly patented invention of the same inventors, providing a superior apparatus for separating lighter and heavier particles of ore and other substances in the same manner as is now done by a skilled hand in "panning." By the improvement a simple mechanism is made to impart to a conical vessel a varying motion around a fixed center, and an oscillating motion, eccentric to the center of reciprocal motion, around its own center, the different velocities allowing substances of different weights to come to rest or continue in suspension for purposes of separation. The apparatus is principally designed for separating gold from gravel and sulphurets from quartz, but apatite or phosphate of lime may likewise be separated from heavier material.

### Mechanical.

COMBINATION PLANE.—Jacob W. Tripp, Salt Lake City, Utah. This invention consists principally of a stock adapted to receive a removable wooden sole piece shaped to conform to the curved or straight surface to be planed, a bit having gear teeth being engaged by a segmental lever for shifting the bit into proper position, and there being an auxiliary guide stock pivoted on an adjustable arm held on the main stock. The plane is of simple and durable construction, and it is arranged for universal adjustment, to enable the operator to conveniently plane straight or curved work, such as stair rails on all sides, and for moulding, fitting, plowing, tonguing, rabbeting, etc.

HAND CRIMPING TOOL.—John Wood, Long Island City, N. Y. This is a strong and simple tool for quickly and firmly crimping a cap on the flaring mouth of an oil can or other receptacle. It consists of a stock on which is held a disk, levers being pivoted on the stock which have handles at their upper ends and crimping rolls journaled on their ower ends adjacent to the edges of the disk. The disk serves as an anvil to properly permit the three crimping rolls to crimp the flange in under the flaring mouth of the spout.

HOD HOISTING MACHINE.—Gustaf P. Wern, Brooklyn, N. Y. In this machine a stay shaft on which is a spacing sleeve connects the upper ends of the standards, chain wheels turning on bearings of the sleeve, and there being friction rolls between the wheel hubs and the bearings. The hoisting wheel consists of two parallel chain wheels and a driving sprocket wheel at the outer side of one of the chain wheels, bolts on which are tubes or spacing sleeves extending through all the wheels and connecting them. The friction is reduced to a minimum by the employment of friction rolls in the bearings, and the machine is very strong and durable, the individual parts not being liable to be thrown out of alignment under the heaviest strains.

### Agricultural.

HARVESTER ATTACHMENT.—Charles Stucke, Appleton, Minn. According to this improvement, gathering pans or screens underlie the platform and elevator aprons and the binding table, in combination with troughs, spiral conveyors and elevator chain, to gather any shelled grain falling out and convey it to a bagging device. The attachment is designed to save the shelled grain which may become incidentally thrashed out in the operation of cutting, elevating and binding it into sheaves, and which ordinarily falls to the ground and is wasted.

SHOVEL PLOW.—William F. Hartig, Evansville, Ind. This invention relates to plows having laterally extending wings or sweep members, and the inventor has devised a construction in which the several sweep or cutter attachments can be readily attached to or detached from the standard, and can be readily adjusted to the desired vertical angles, as the condition of the hill or row may require. The plow may be used as an ordinary bull tongue plow, or it may have lister blades at each side, double cutter wings, or one cutter and one lister wing, in either adjustment, the wings being quickly and easily swung inward or outward by shifting the operating levers, or they may be swung parallel with the heel of the standards.

### Miscellaneous.

APPARATUS FOR TANNING.—William T. Harrison, Pooler, Ga. This apparatus comprises sets of airtight vessels for the hides to be tanned, one set to be filled at a time with the tanning liquor, a reversing pump pumping the liquor from the filled vessel into the empty ones, and from the latter into the first vessel, while heaters are provided for heating the liquor as it is discharged from the pump to the vessels. The hides are, by this means, alternately subjected to the action of the tanning liquor and a complete vacuum. The vessels are reinforced in such a way as to make them perfectly airtight and entirely safe when the vacuum is formed.

COAL AND GAS STOVE.—Donald McDonald, Louisville, Ky. This is an improvement on a gas stove formerly patented by the same inventor, to enable it to burn coal or other solid fuel as well as gas, and at the same time. The invention consists chiefly in the combination of a gas burner, a solid fuel grate or basket, and a supplemental grate which may be adjusted to cover and protect the gas burner and asbestos lining, when coal is used, or may be thrown back to expose the gas burner and give it full effectiveness when gas alone is used. The improvement affords a very cleanly, quick and desirable method of igniting coal and starting a fire without kindling wood.

STEAMER AND BAKER.—Burchard T. Kuhl, Orlando, Fla. This is a cheap and simple apparatus which may be used over a lamp. It has a lower steaming compartment adapted for use in steaming food or making jelly, preserves, etc., and an upper oven for baking, the oven being so arranged that it may be converted into a steaming chamber if desired. All the parts are readily accessible and the joints are closed by a water seal, so that the flavor of the things cooked may be retained and the odor will not escape into the room. Articles contained within it may be kept hot with very little heat.

DISCOUNT WHEEL.—James G. Huffman, Decatur, Ill. This is a wheel to be revolved by the dropping of a coin in a slot, the wheel stopping at places which cannot be previously determined and pointing out certain discounts to be made to the person operating it. The machine is of simple construction and attractive in appearance. The coins which work the wheel are dropped into a till, and the wheel is designed to afford amusement with the attractiveness of speculation.

FILLING MACHINE.—John F. Wolven, St. Clair, Mich. For filling simultaneously a large number of vessels with a liquid, as the filling of bottles or communion cups for church services. this inventor has devised a machine comprising a reservoir with funnels and elastic valves with upwardly extending rods, each valve rod being connected with one of a series of arms extending from shafts journaled in suitable bearings, there being a handle by which all the shafts may be given a swinging motion to open and close the valves.

PUMP PIN.—James W. Mapps, York, Neb. This is a pin especially adapted for connecting the pump rod to a windmill. It has a body section and a drop section, the latter being shorter than the body section, and when the body section is employed as a pump pin it is provided with a head. The head is not needed when the pin is employed as a horizontal clevis for plows, or similar purposes, the head end of the body being then threaded to receive a nut.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each, Please send name of the patentee, title of invention, and date of this paper.

## SCIENTIFIC AMERICAN BUILDING EDITION.

**MAY, 1895.—(No. 115.)**

TABLE OF CONTENTS.


1. Plate in colors, showing a residence at Glen Ridge, N. J., recently erected for W. T. Taliaferro, Esq. Perspective elevation and floor plans. A fine example in the Colonial style. Mr. Chas. E. Miller, architect, New York.
2. Perspective elevation and floor plans of a cottage at Tenafly, N. J., erected for Chas. Vogt, Esq., at a cost of $5,800 complete. Mr. W. L. Stoddart, architect, New York. An attractive design.
3. A dwelling at Kennebunkport, Me. Three perspective elevations and floor plans. A most picturesque residence, with many artistic features. Mr. Henry P. Clark, architect, Boston, Mass.
4. A log cabin chapel recently erected at Black Rock, Conn. Perspective elevation and ground plan. Mr. Bruce Price, architect, New York.
5. A cottage at Park-Hill-on-Hudson, N. Y., recently erected for Geo. L. Rose, Esq., at a cost of $12,000 complete. Two perspective elevations and floor plans. Mr. A. F. Leicht, architect, New York. A well executed design, showing many excellent features.
6. A house at Orange, N. J., recently completed for Thomas L. Smith, Esq. Messrs. Child & De Goll, architects, New York. A pleasing design in the Colonial style.
7. The Yonkers Public School, No. 8, at Bronxville, N. Y. A good example of school architecture.
8. A dwelling of modern design, recently erected for M. Strong, Esq., at Montclair, N. J. Two perspective elevations and floor plans. Cost complete, $6,000. Mr. Christopher Myers, architect, New York.
9. A house at Indiana, Pa. Perspective elevation and floor plans. Cost complete $3,100. Architect, Mr. E. M. Lockard, Indiana, Pa. An attractive design in the Colonial style.
10. A very attractive residence at Montclair, N. J., erected for Frederick S. Gage, Esq. Perspective elevation and floor plans. Mr. E. R. North, architect, Montclair, N. J
11. View of Capistrano Station, California.
12. Design for a fireplace.
13. The brick power station of the Brooklyn City Railroad Company.
14. Miscellaneous Contents: A State park in the Catskill Mountains.—To prevent the slamming of screen doors, illustrated.—Quarrying by means of fire.—A new lawn sprinkler, illustrated.—Art in metal tile roofing, illustrated.—An improved hot water heater, illustrated.—A macadamized road through swampy land.—Tinners' hardware and roofers' supplies.—Screen doors, illustrated.—Stair finishing, illustrated.—A hoist for use over hatchways, illustrated.—Ventilating the school room.—Gas burning range, illustrated.


The Scientific American Building Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid MAGAZINE OF ARCHITECTURE. richly adorned with elegant plates and fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

## Business and Personal.

*The charge for insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.*


"U. S." metal polish. Indianapolis. Samples free.

Marine Iron Works, Chicago. New catalogue free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

For mud dredging engines. J. S. Mundy, Newark, N. J.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Handle turning machinery. Trevor Mfg. Co., Lockport, N. Y.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

I make gated patterns of engraved designs as perfect as hand engraved work. Twining Campbell, Liberty Street, Paterson, N. J.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 36 Broadway, N. Y.

For the original Bogardus Universal Eccentric Mills Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 28 to 36 Rodney St., Brooklyn, N. Y.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.


## Notes & Queries

### HINTS TO CORRESPONDENTS.

**Names and Address** must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

**References** to former articles or answers should give date of paper and page or number of question.

**Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

**Buyers** wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

**Special Written Information** on matters of personal rather than general interest cannot be expected without remuneration.

**Scientific American Supplements** referred to may be had at the office. Price 10 cents each.

**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(6528) W. E. B. says: Can you give me any information as to how the fine crocus finish, such as put on razors and fine pocket cutlery, is accomplished? A. For hollow finishing, the following wheels are required: A mahogany wheel for rough glazing. A mahogany wheel for smooth glazing. A lead wheel or lap. For flat finishing: A buff wheel for rough. A buff wheel for smooth. A buff wheel for finishing. Lastly, a polisher. To make the glaze wheels: Get the spindles, and point them on each end; then get a block of beech and wedge it on the steel at one end with iron wedges; and turn it for the pulley for the band to run on. Take two pieces of flat mahogany and glue and screw them together, so that the grain of one piece crosses the other to prevent warping. Let it get thoroughly dry, and wedge it on the spindle and turn it true. The lead wheel is made the same way, but wider, and has a groove turned in the edge. The wheel is put into sand, and a ring of lead run round the edge; it is then turned true. To make the buff wheels, proceed as with the glaze; but to save expense, pine or deal wood will do as well as mahogany, only leave it about double the width of the glaze, which is about ½ inch wide by 12 or 14 inches across. The buff wheels are covered with glue, and then the leather is tacked on with tacks driven in about half way, so that they may be easily drawn out again. The leather is then turned true. The polisher is made the same way, but the size of the polisher must be a little less than any of the other wheels, say about 1 inch. The buff wheels are dressed by laying on a fine thin coat of clear glue, and rolling them round—No. 1, in superfine corn emery; No. 2, in smooth emery; No. 3, by making a cake of equal parts of mutton suet, beeswax, and washed emery; then it is held on the wheel while it is going round. The glaze wheels are dressed while using, by mixing a little of the emery with oil, and putting it on the wheel with a stick or the finger. The leather of the polisher is not covered with glue, but dressed with a mixture of crocus and water, not oil. Care must be taken to keep each wheel and substance to themselves; the work must be carefully wiped after each operation, and cleanliness must be studied above all things in using the polisher, as the slightest grease getting on it stops the polishing.

(6529) J. M. asks: 1. Is perspiration weakening? A. No; unless accompanied by disease. 2. What is the difference between a rapid rectilinear and a single view lens? A. A rapid rectilinear is what its name indicates. A single view may not be rapid. It always distorts the image, especially near the margin. 3. Will a square tube with a square cut prism answer as well as the round tube for the spectroscope, No. 672? A. Yes. 4. What size lens should I use to take a common size cabinet portrait? A. Use the size given by reputable makers. If it is only a question of taking the image without regard to other considerations, any convex lens will take an image. You will be sure of good results only with good lenses made for the particular kind of work to be done. 5. How can I prepare my own dry plates? A. We cannot give the information in the space at our command. Consult SUPPLEMENT, Nos. 647, 649, 696, 541, 374, 340, 299, 272, or Sinclair's "Dry Plate Making," which we can mail you for 50 cents.

(6530) F. W. L. says: 1. How can I make a cement for the splices of a leather belt? A. Take of common glue and American isinglass, equal parts; place them in a boiler, and add water sufficient to just cover the whole. Let it soak ten hours, then bring the whole to a boiling heat, and add pure tannin until

© 1895 SCIENTIFIC AMERICAN, INC.

the whole becomes ropy or appears like the white of eggs. Apply it warm. Buff the grain off the leather where it is to be cemented; rub the joint surfaces solidly together, let it dry a few hours, and it is ready for practical use; and if properly put together, it will not need riveting, as the cement is nearly of the same nature as the leather itself. 2. Also a good dressing for same kind of belt? A. Five parts of India rubber are cut fine and melted together with 5 parts of oil of turpentine in an iron, well covered vessel; then add 4 parts of resin, stir well, melt, and add 4 parts of yellow wax, stirring constantly while melting. This mixture while warm is added with constant stirring to a melted mixture of 15 parts fish oil and 5 parts of tallow, and the whole is agitated until it has congealed. The mass is applied to old belts upon both sides in a warm place, and when the belts are in use, from time to time upon the inner side. By this treatment they become very durable. 3. Is it injurious to any kind of dynamo to run for any considerable length of time with any lamps or motors in circuit with it? A. No; unless it becomes unduly heated. 4. How can I find the horse power of a common slide valve engine? A. Multiply the square of the diameter of the cylinder in inches by 0·7854, and this product by the mean engine pressure, and the last product by the piston travel in feet per minute. Divide the last product by 33,000 for the indicated horse power. In the absence of logarithmic formulæ or expansion table, multiply the boiler pressure for ⅝ cut-off by 0·91; for ½ cut-off by 0·85; ⅜ cut-off by 0·75; 3-10 cut-off by 0·68. This will give the mean engine pressure per square inch near enough for ordinary practice, for steam pressures between 60 and 100 pounds, always remembering that the piston travel is twice the stroke multiplied by the number of revolutions per minute. 5. What is metallic packing? Is it applicable to the stuffing box of engine? A. Metallic packing is used for steam engine piston rods. It is made in metal rings or mixed with other packing. 6. What is the lubricant for commutators? A. Use a small quantity of oil.

(6531) W. H. M. asks: 1. If the rear sprocket of a bicycle were 6 inches in diameter and the front one in proportion, would it run easier than if made the usual size? A. Possibly. We understand that the principle is now being tried on some French bicycles. 2. If a bicycle had a chain on each side, would it run with less friction than with single chain. A. Data are wanting to determine this. It is so much trouble to keep one chain in order that we should be very slow to introduce a second one.

(6532) F. F. asks: What is the temperature of the bottom sheets of a tubular boiler on the side next to the fire when the boiler is forced to its full capacity? Also what is the temperature on the water side of same? The above question came up at a meeting of our association; one member claimed that it was 1,100 degrees on the side next to fire. Some said he was right, others said he was not, so to settle the matter it was left for you to decide for us. A. The temperature of the water side of fire sheets is but little above the temperature of the water when making steam, probably 150 to 200 degrees. The iron is a quick transmitter of heat, and although the fire against the fire sheet may be 1,400 to 1,600 degrees, the surface of the plate is seldom above 600 degrees.

(6533) R. A. C. writes: I have made motor No. 641, and it works so well that I write you to let you know how I made it. I have provided a bronze bar commutator and a cast field; the field is mounted to stand erect, and the bearings are made of brass and screwed to the poles. I have also made a dynamo like the eight light dynamo except it is two-thirds size, and it runs the above motor nicely.

(6534) J. J. D., Kan., writes: The inner sides of the steam chest of an engine we have are being continually eaten away. The metal becomes so soft that it can be easily cut into with a knife. We can't see any reason for it unless it be that some acid gets mixed up with the steam. But we do not know where it comes from. We use ordinary rain water in the boiler. To prevent leakage between joints the steam chest is packed with asbestos paper. Could the acid come from this, owing to the way the fiber may have been treated? As the chest has been thoroughly cleaned lately, we have no means of examining at present the product formed. If you could tell the real cause and suggest a remedy, you would greatly oblige us. A. The water from the condensing steam on the inner surface of the steam chest is an absorbent of iron and is known to disintegrate and carry away the iron, leaving the graphitic carbon in place, and in a condition to be cut away with a knife. This is notably so with very soft castings, which contain a large percentage of carbon. There is only a partial remedy in the making of engine parts that are in contact with steam to have the iron low in carbon. By cutting off a portion of the soft surface and testing, you will find it characteristic of ordinary graphite.

(6535) J. M. C. asks how to distinguish between gold and its imitations, either plated articles or alloys. A. An assay or analysis is the only good method. The following may answer for rough tests: Gold should dissolve in a mixture of one part nitric with three parts hydrochloric acid. A residue indicates silver. If sulphuric acid is added to the solution, a precipitate indicates lead. One quick method is to determine its specific gravity. Silver may be dissolved in nitric acid. It should, with excess of ammonia, give a colorless, clear solution. Sulphuric acid may be used to test for lead.

(6536) G. W. W. says: Will you kindly republish the formula for your buffalo moth exterminator? It did its work in a thorough manner, but I have carelessly mislaid your formula and would greatly appreciate its republication. A. Take strips of red or blue flannel, as these colors are particularly attractive to them, dip in solution of arsenic and lay around the edges of carpets or wherever the pests are troublesome.

(6537) T. Y. C. says: Please give me in the SCIENTIFIC AMERICAN a recipe for an elastic waterproof glue. A. Glue which stands moisture without softening. Dissolve in 8 fl. oz. of strong methylated spirit ½ ounce each of sandarac and mastic; next add ½ ounce of turpentine. This solution is then added to a hot, thick solution of glue, to which isinglass has been added, and is next filtered while hot through cloth or a sieve


## TO INVENTORS.

An experience of nearly fifty years and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.


# INDEX OF INVENTIONS

**For which Letters Patent of the United States were Granted**

**May 14, 1895,**

**AND EACH BEARING THAT DATE.**

[See note at end of list about copies of these patents.]

Alarm. See Fire and water alarm.
Album, easel, W. Bergner ..... 539,028
Alkaline bichromates, making, M. W. Beylikgy .. 539,029
Animal trap, E. Andrews ..... 539,030
Animal trap, E. Peters ..... 539,033
Annunciator connection for multiple switch-boards, G. Taintor ..... 539,099
Back pad, J. S. Powell ..... 539,300
Bag filling machine, H. H. Cummings ..... 539,171, 539,218
Bale tie fastening, F. D. Van Arsdale ..... 539,103
Barrel, J. Maddock ..... 539,185
Basin clamp, H. B. Sherman ..... 539,197
Bathing appliance, J. L. Prentiss ..... 539,301
Bearing, ball, G. F. Simonds ..... 539,080
Bedstead brace, A. S. Bains ..... 539,333
Bedstead head rest A. W. Darre ..... 539,039
Bicycle clutch. M. Kelly ..... 539,273
Blooms, etc., device for handling, T. James ..... 539,132
Boiler. See Steam boiler.
Boiler cleaner skimmer, F. W. Hornish ..... 539,272
Book cover. W. Wollman ..... 539,372
Bookmaking machine. Bellamy & Craw ..... 539,025
Bottle washer, S. L. Gillett ..... 539,384
Bouquet holder, E. W. Troop ..... 539,101
Bowl, wash, J. Totham ..... 539,203
Box. See Signal call box.
Bracket attachment for tubular uprights, W. A. Lippbard ..... 539,364
Brake. See Cycle brake.
Brick press, W. Brightmore ..... 539,247
Broom support, J. W. Davis ..... 539,557
Brush, W. S. Bentley ..... 539,027
Bucket elevator, J. Cavanagh ..... 539,550
Buckle, G. N. Buck ..... 539,104
Buckle, suspender. Jewett & Sargent ..... 539,133
Burner. See Petroleum burner.
Butcher's derrick, C. F. Brown ..... 539,341
Butter cutter, R. Packard ..... 539,144
Button, T. R. Hyde, Jr ..... 539,225
Button, collar, C. H. Knubel ..... 539,137
Call apparatus, magneto, F. B. Cook ..... 539,170
Caloric engine, W. P. Arschauloff ..... 539,213
Can. See Tin can.
Can labeling machine, E. E. Makee ..... 539,280
Can opener, J. Gould, Jr ..... 539,261
Candlestick, F. V. Eavenson ..... 539,252
Candlestick, T. J. & O. Q. Stille ..... 539,199
Canopy for brackets or chandeliers, L. F. & W. L. Van de Wiele ..... 539,316
Caponizer, H. M. Seybold ..... 539,309
Car, convertible freight, J. V. Ericson ..... 539,220
Car coupling, H. R. Brocius ..... 539,034
Car coupling, C. W. Diederich ..... 539,359
Car coupling, P. McEntee ..... 539,143
Car coupling, T. L. McKeen ..... 539,286, 539,287
Car coupling, H. E. Moomaw ..... 539,389
Car coupling, J. L. Richards ..... 539,306
Car, drop bottom, H. D. Carryl ..... 539,349
Car fender, Collier & May ..... 539,169
Car fender, A. Edwards ..... 539,042
Car fender, A. E. Flattick ..... 539,048
Car fender, W. B. George ..... 539,050
Car fender, H. P. Johnson ..... 539,134
Car fender, M. & V. F. Maidhof ..... 539,281
Car fenders, operating street, C. R. Hall ..... 539,385
Car fender, street, C. R. Hall ..... 539,265
Car guard or fender, J. O. Brown ..... 539,342
Car, poultry, F. X. Mudd ..... 539,229
Car wheel and axle, L. S. Flatau ..... 539,256
Car wheel for electric cars, etc., C. Thompson ..... 539,212
Carbon brush holder for dynamos, W. S. Bosley .. 539,032
Cartridge clip, R. F. Cook ..... 539,038
Cartridge, practice, G. D. R. Aikin ..... 539,327
Cash register, Breidenbach & Smyth ..... 539,033
Caster, C. A. Tucker ..... 539,156
Casting anodes direct from converters, car and set of moulds for, Hixon & Dyblie ..... 539,270
Casting pig metal, apparatus for, S. W. Vaughen. 539,157
Catapult, E. L. Lewis ..... 539,183
Cellar, waterproof, F. B. Gilbreth ..... 539,259
Cellulose, apparatus for sorting and separating pieces of wood for manufacture of, L. Piette .. 539,296
Chair. See Invalid chair.
Chest, tea, C. W. Lutes ..... 539,227
Chuck, drill, R. M. Russell ..... 539,193
Clamp. See Basin clamp.
Clamp die, Aylworth & Leslie ..... 539,332
Clamping tool, hand, Aylworth & Leslie ..... 539,331
Clutch and coupling, G. F. Clamer ..... 539,249
Cock, tap, J. A. Wummer ..... 539,324
Coffee mill and canister, combined, J. F. Buschmann ..... 539,345
Coffee pot, J. H. Burrows ..... 539,105
Collar fastening, horse, W. Hughes ..... 539,190
Collar pad, W. T. O'Brien ..... 539,231
Communicating, signaling, etc., to or from movable objects, J. Y. Porter ..... 539,298
Communion service, C. Hall ..... 539,264
Commutator segments, method of and means for assembling, A. F. Batchelder ..... 539,022
Cooking canned goods, machine for, J. H. Empson ..... 539,124
Corn husking machine, E. A. Partelow ..... 539,081
Corn sheller, E. W. Douglas ..... 539,219
Corn sheller, A. H. Patch ..... 539,082
Corset fastening, P. Meyer ..... 539,141
Cotton condenser and gin, J. F. Swinnerton et al. 539,202
Cotton elevator and distributer, Zedler & Ward .. 539,325
Coupling. See Car coupling. Flexible coupling. Pipe coupling. Tube coupling.
Cover fastener, H. D. Stockbridge ..... 539,095
Creamer, centrifugal, O. Ohlsson ..... 539,399
Crusher. See Stone crusher.
Cultivator, J. H. Gilman ..... 539,174
Cultivator, F. A. Head ..... 539,223
Cup head or piston packing, J. F. Pruden ..... 539,085
Currycomb, H. P. Merriman ..... 539,186
Curling iron, J. H. Broomall ..... 539,340
Curtain fixture, I. Williams ..... 539,108
Cutter. See Butter cutter.
Cutter head for woodwork, rotary, C. E. Zimmermann ..... 539,326
Cycle brake, J. S. Foley ..... 539,125
Dentiscalp and mouth mirror, combined, D. C. McNaughton ..... 539,076
Die. See Clamp die.
Digger. See Potato digger.
Dish cleaner, J. J. Walsh ..... 539,317
Door check, J. S. Shrawder ..... 539,088
Door check, fluid, A. A. Page ..... 539,236
Door hanger, S. E. Horning ..... 539,271
Door, screen and storm, M. A. Hanson ..... 539,176
Draught equalizer, F. A. Polka ..... 539,084
Draught equalizer, J. Schiffer ..... 539,087
Elbow joint, ventilating, R. C. Doenitz ..... 539,360
Electric conductor, J. R. Hare ..... 539,222
Electric light head gear for personal ware, Rodriguez & Rockwell ..... 539,192
Electric motor, J. C. Lincoln ..... 539,277
Electric motor controller, Parshall & Darley, Jr .. 539,293
Electric motor starting box, D. M. Bliss ..... 539,376
Electrical connector, F. N. Bell ..... 539,024
Electrical wires, crossarm for carrying, T. T. Eckert ..... 539,123
Elevator. See Bucket elevator. Cotton elevator
Elevator indicator, R. Challis ..... 539,351
End gate and scoop board for wagons, combined, Kerr & Moore ..... 539,060
Engine. See Caloric engine. Gas engine. Steam engine.
Engine indicator, steam, A. C. Lippincott ..... 539,398
Extractor. See Oil extractor.
Fabric, R. W. Huss ..... 539,224
Fan, R. Zimmermann ..... 539,208
Fan for rocking chairs, cradles, etc., automatic, F. Finke et al ..... 539,047
Fence post, J. W. Williams ..... 539,159
Fiber preparing machine, C. A. Green ..... 539,262
Filtration and carbonation of beer, etc., method of and apparatus for, O. Zwietusch ..... 539,111
Fire and water alarm, electric, G. S. Neu ..... 539,234
Firearm, magazine, R. F. Cook ..... 539,037
Firearm, magazine, J. L. McCullough ..... 539,230
Fireproof partition, etc., Poulson & Ellis ..... 539,384
Fireproof partition, ceiling wall, etc., T. Bailey .. 539,214
Fish hook weed guard, W. P. Shattuck ..... 539,140
Flashlight mechanism, M. W. Newcomb ..... 539,077
Flexible coupling, T. R. Almond ..... 539,161
Flooring, constructing and laying mosaic work, C. D. Jackson ..... 539,131
Flue cleaner, boiler, R. Faries ..... 539,046
Frame. See Metal frame.
Fruit, drying, F. W. Gibson ..... 539,258
Furnace. See Gasoline furnace. Metallurgical furnace.
Furnace and apparatus for treatment of refuse of cities, J. J. Storer ..... 539,096
Furniture, convertible, J. S. Shearer ..... 539,310
Furniture, metallic knockdown, S. Schlesinger ..... 539,195
Game apparatus, W. B. Bust ..... 539,346
Gaming device, G. Wilkening ..... 539,107
Garbage, method of and apparatus for treatment and reduction of, J. C. Anderson ..... 539,245
Garment supporter, J. Gump ..... 539,127
Gas engine, H. J. Dykes ..... 539,122
Gas, manufacturing, Logan & Janeway, Jr ..... 539,064
Gas retorts, means for charging, H. M. Pierson ..... 539,295
Gasoline furnace, C. T. Tarpenning ..... 539,152
Gate. See end gate.
Gate, E. C. Moore ..... 539,228
Glass articles, mould for making, J. D. Claypoole. 539,168
Glass cutting, electric, I. L. G. Rice ..... 539,302
Glove, J. W. Everest ..... 539,044
Grain dump and elevator, A. Fulton ..... 539,257
Guitar, J. Holtvogt ..... 539,056
Hanger. See Door hanger. Pipe hanger. Shaft hanger.
Harrow, rake, and truck, combined, H. Rea ..... 539,303
Harvesting machine, fodder, W. G. Smith ..... 539,091
Hasp lock, F. L. Stewart ..... 539,151
Hat book, J. Savoie ..... 539,194
Heater. See Hot water heater.
Heater, W. Campbell ..... 539,166
Hinge, W. S. Ivins ..... 539,057
Hook. See Hat hook.
Horseshoe, C. C. Jerome ..... 539,058
Horseshoe pad, J. Sweeney ..... 539,098
Horseshoe, soft tread, J. Gleason ..... 539,053
Hot water heater, B. Etienne ..... 539,043
Ice making tank, S. W. Johnson ..... 539,363
Index, file, W. L. Brewer ..... 539,116
Indicator. See Elevator indicator. Engine indicator. Railway time indicator.
Inkstand, C. N. Brown ..... 539,343
Insect powder duster, L. W. Turner ..... 539,102
Insulator, L. H. Desisles ..... 539,040
Invalid chair, Doolittle & Schmidt ..... 539,041
Kitchen cabinet, G. W. Wysor ..... 539,109
Lamp, arc, C. A. Pfluger ..... 539,392
Lamp clutch, electric arc, W. B. Luce ..... 539,365
Lamp, electric, W. H. Sheppard ..... 539,150
Lamp, electric arc, C. A. Pfluger ..... 539,393
Lamp having regenerative gas burner, Gordon & Swift ..... 539,175
Lathe, J. & J. Young ..... 539,110
Leather blackening and dressing composition, Woods & Maclay ..... 539,323
Leather working machine, I. Vaughn ..... 539,104
Lens, Turner & Reich ..... 539,370
Lighting system, hydrocarbon, R. J. Eger ..... 539,173
Liquid circulating and pumping apparatus, J. T. Morrow ..... 539,075
Liquid circulating or pumping device, J. T. Morrow ..... 539,074
Liquid elevating apparatus, Roussel & Boucher .. 539,146
Lock. See Hasp lock. Sash lock.
Lock, J. E. Goodbue ..... 539,397
Locomotive bell ringer, H. Breitenstein ..... 539,339
Log carrier, J. A. Carroll ..... 539,380
Loom for weaving double fabric for plush, H. J. Hope ..... 539,179
Loom shedding mechanism, A. Lockwood ..... 539,278
Loom shuttle, J. C. Sergeson ..... 539,238
Loom temple, R. P. Pearson ..... 539,188
Loom temple, E. S. Stimpson ..... 539,241
Mail bag delivering apparatus, B. D. Ayars, Jr., 539,330, 539,373, 539,374
Mat. See Stove or table mat.
Match splint coiling machine, J. H. Mantion ..... 539,067
Matrix making and stereotyping, A. C. Ferguson. 539,253
Metal frame and stock therefor, A. Wanner, Jr .. 539,318
Metal planing machine, F. E. Norton ..... 539,078
Metal sawing machine, J. & R. J. Balz ..... 539,246
Metallurgical furnace, automatic smokeless, F. L. Bartlett ..... 539,021
Meter. See Power meter.
Mill. See Coffee mill.
Mining machine, dry placer, J. H. Simison ..... 539,312
Mining, placer, S. S. Harper ..... 539,054
Mould. See Sand mould.
Motor. See Electric motor. Multiple cylinder motor.
Mowing machine, G. Chapman ..... 539,217
Mowing machine cutter bar, O. Cook ..... 539,036
Multiple cylinder motor, E. B. Benham ..... 539,026
Negative plates, making, W. S. Phillips ..... 539,368
Offset mechanism, W. Spalckhaver ..... 539,198
Oil extractor for exhaust steam, H. E. Moffat ..... 539,073
Opera chair, automatically folding, R. Schubert .. 539,196
Organ action, M. Hetherington ..... 539,178
Organs, means for operating pressure bellows of, W. Schwarze ..... 539,308
Overshoe fastener, W. C. Arnold ..... 539,329
Overshoes in place, device for holding, I. Good .. 539,361
Packing, F. J. Waters ..... 539,371
Pad. See Back pad. Collar pad. Saddle pad.
Padlock, A. A. Page ..... 539,235
Paints, agitator for mixed, C. J. McLennan ..... 539,288
Paper cutting machine, R. Miehle ..... 539,070, 539,071
Paper sheets, receiving needle for sticking on of, C. Burgin ..... 539,215
Pavilion, folding, A. Lorenz ..... 539,226
Paving roller, C. H. Burwinkle ..... 539,035
Pen reservoir attachment, H. L. Braham ..... 539,115
Pencil attachment, Clark & Vick ..... 539,352
Petroleum burner, L. Baumgartner ..... 539,375
Phonograms, apparatus for reproducing, E. H. Amet ..... 539,212
Pictures, etc., frame for, M. C. Julien ..... 539,135
Pile fabrics, knife for cutting, D. Scott et al ..... 539,147
Pipe bender, J. Bropson ..... 539,378
Pipe corrugating machine, W. J. Plecker ..... 539,297
Pipe coupling, J. Barrett ..... 539,112
Pipe hanger, H. Harbeckes ..... 539,266
Pipe sleeve, steam, J. Collis ..... 539,119
Pipe wrench, W. F. Born ..... 539,031
Planter attachment, corn, D. W. Matsler ..... 539,282
Planter, corn, Helvern & McGuire ..... 539,267
Planter, cotton, Head & Kerns ..... 539,362
Planter, potato, F. F. Wolgamuth ..... 539,243
Planter, seed, J. A. Mengel ..... 539,069
Plow and attachment, J. M. Hudson ..... 539,131
Plow, rotary gang, W. B. Willis ..... 539,322
Plow subsoil attachment, L. McWhinney ..... 539,289
Pneumatic tool, W. H. Soley ..... 539,240
Pocketbook, L. Cano ..... 539,248
Post. See Fence post.
Potassium cyanide, making, W. M. Mackey ..... 539,279
Potato digger, P. Tiedemann ..... 539,314
Power meter, E. L. Abbott ..... 539,244
Press. See Brick press. Printing press.
Pressure regulator, fluid, P. G. Van Wie ..... 539,205
Printing, J. C. Hemphill ..... 539,268
Printing machine offset mechanism, J. C. Hemphill ..... 539,269
Printing plate, L. Grossman ..... 539,221
Printing press, J. Brooks ..... 539,377
Printing press, J. L. Cox ..... 539,356
Printing side surfaces of metallic capsules, machine for, F. Lewin ..... 539,276
Puller. See Stump puller.
Pulley, R. F. Hargraves ..... 539,129
Pulley, sash, W. T. Kellogg ..... 539,059
Pulley, speed, W. M. McIntyre (r) ..... 11,495
Pulley, split, A. J. Williams ..... 539,160
Pulverizer, land, B. A. Thomas ..... 539,153
Pump, F. Mis ..... 539,072
Pumps, valve and valve operating mechanism for, J. C. Gibbens ..... 539,052
Push button, electric, A. J. Oebring ..... 539,079
Railway, closed conduit electric, P. Lucas ..... 539,184
Railway signal, J. Stringham ..... 539,396
Railway signal operating device, F. Hardy ..... 539,128
Railway signal system, G. L. Thomas ..... 539,154
Railway switch, automatic, A. C. McKenzie ..... 539,232
Railway tie, metallic, W. H. Addicks ..... 539,210, 539,211
Railway time indicator, G. H. McGuire ..... 539,285
Refrigerator, J. C. Lilly ..... 539,387
Register. See Cash register.
Regulator. See Pressure regulator. Water supply regulator.
Rendering and drying apparatus, E. Holtbaus ..... 539,055
Rheostat, A. C. Carey ..... 539,216
Rheostat, variable, E. P. Warner ..... 539,105
Roaster, L. A. Miller ..... 539,283
Robbers, mechanism for foiling train, T. Toomey 539,100
Rock drill actuating device, J. Duncan ..... 539,251
Rock drills, rotary feed for, H. Koch ..... 539,062
Roller. See Paving roller.
Rollers in mechanical underground hauling, scratch fork for, A. Lauenroth ..... 539,083
Roofing implement, F. G. Caldwell ..... 539,347
Rubber belts, method of and apparatus for joining ends of, T. Robins, Jr ..... 539,145
Saddle pad, F. W. Wall ..... 539,207
Sand mould, S. J. Adams ..... 539,209
Sash and sash frame, window, Walker & Albert .. 539,206
Sash fastener, I. W. Lord ..... 539,140
Sash lock, H. Bitner ..... 539,030
Sawmill, band, W. M. Wilkin ..... 539,320
Sawmill carriage, W. M. Wilkin ..... 539,321
Sawmill feeding mechanism, C. Reiser ..... 539,305
Sawmill head block, W. M. Wilkin ..... 539,319
Scaffold, adjustable window, A. Strub ..... 539,200
Scarf pin guard, F. Wessel ..... 539,158
Screwdriver, J. J. Tower ..... 539,155
Screw wrench, W. R. Sherman ..... 539,311
Sewing machine felling attachment, J. W. Betz .. 539,336
Shaft hanger, H. Everline ..... 539,045
Shafts, device for securing small wheels on, Gottschalk & Sipe ..... 539,260
Sheet metal package, cylindrical, F. G. Caldwell .. 539,348
Sheet metal vessels, making, J. Gillet ..... 539,051
Sheller. See Corn sheller
Ships at sea, apparatus for stopping leaks in, W. F. Beart ..... 539,023
Ship's light and air port, T. Utley ..... 539,315
Signal. See Railway signal.
Signal call box, A. B. French ..... 539,049
Signaling system, J. P. Coleman ..... 539,354
Snow plow, W. F. Wheeler ..... 539,106
Sole, lamb's wool or slipper, S. Borchardt ..... 539,337
Sound waves, recording and reproducing, A. C. Ferguson ..... 539,254
Speed of vehicles, apparatus for indicating and signaling, J. W. Darley, Jr ..... 539,381
Spinning machinery separator, W. E. Sharples .... 539,148
Spool holder, L. P. Carle ..... 539,118
Stamp, cushion, J. P. Cooke ..... 539,355
Stave making machine, J. O. Storvik ..... 539,097
Steam boiler, J. A. Normand et al ..... 539,290
Steam boiler, H. S. Pell ..... 539,189
Steam boiler, R. Reeves ..... 539,304
Steam engine, H. Mackenzie ..... 539,066
Steel rings, method of and apparatus for hardening, G. F. Simonds ..... 539,089
Stencil, W. G. Fuerth ..... 539,383
Stone crusher, M. J. Stanton ..... 539,092
Stone manufacture of artificial, C. A. Peters ..... 539,190
Stoneware, decorating, A. W. Paull ..... 539,187
Storage structure, J. M. Dodge ..... 539,250
Stove, cooking, L. Edel ..... 539,362
Stove or table mat, F. P. Bixler ..... 539,114
Stovepipe, G. B. Barclay ..... 539,334
Stovepipe cleaner and soot gatherer, I. A. Newman ..... 539,391
Stoves, sad iron heater for gas or gasoline, A. Nagel ..... 539,233
Stump puller, C. F. Anthony ..... 539,328
Sulphur candle, C. T. Kingzett ..... 539,061
Surgical operating table, McKee & McClintock ... 539,231
Synchronism, means for effecting, J. H. Rogers .. 539,369
Syringe, vaginal, T. B. Peacock ..... 539,294
Switch. See Electric track switch. Railway switch.
Table. See Surgical operating table.
Tablets, combined carbon roll holder and temporary binder for manifolding, D. T. Baxter ..... 539,113
Tacking machine, N. Lombard ..... 539,065
Tank. See Ice making tank.
Tap or bushing, barrel, H. C. Black ..... 539,162
Teaching the piano, etc., apparatus for, C. F. Pond ..... 539,191
Telephone, M. Martin ..... 539,068
Telephone circuit and apparatus, C. W. McDaniel 539,142
Telephone mounting, T. Kelly ..... 539,274
Telephone transmitter, A. C. Brown ..... 539,163
Telephone transmitter, R. F. Rice ..... 539,086
Tension rods, machine for making, T. A. Lee ..... 539,139
Testing machine, torsional, T. Olsen ..... 539,367
Thill coupling, W. Dee ..... 539,120
Thimble, F. W. & W. Kitto ..... 539,275
Thrashing cylinder shaft bearing, M. T. Reeves .. 539,237
Thrashing machine, W. H. Bowen ..... 539,338
Thrashing machine, P. Herpolsheimer ..... 539,177
Tickets and stamps, self-acting apparatus for issuing, Sussmann & Zahn ..... 539,201
Tile, L. T. Dickson ..... 539,172
Tin can, E. Norton ..... 539,366
Tire, pneumatic, Clark & Young ..... 539,353
Tire, pneumatic, C. H. Guest ..... 539,263
Tobacco cutter attachment, plug, R. A. W. Krampitz ..... 539,138
Toe weight, W. N. Carlisle ..... 539,379
Tongue support, B. F. Ordway ..... 539,080
Tool, combination, N. Baughman ..... 539,335
Tool, combination, H. T. Haynes ..... 539,130
Track sanding device, Schiess & Duester ..... 539,395
Track switch, electric, J. Y. Porter ..... 539,299
Trap. See Animal trap.
Tree protector, M. Burns ..... 539,344
Valve, J. T. Christie ..... 539,167
Valve, hot blast, J. Kennedy ..... 539,182
Valve operating mechanism, H. H. Tracy ..... 539,204
Vehicle dumping body, A. P. Stephenson ..... 539,093
Vehicle running gear, G. A. Keith ..... 539,136
Vehicle running gear, L. F. Robare ..... 539,307
Velocipede seat, R. F. McCoy ..... 539,284
Vending device, W. Diebel ..... 539,121
Wagon, dumping, W. G. Stewart ..... 539,094
Warping machines, electric stop motion for, C. Denn et al ..... 539,358
Washer. See Bottle washer.
Watchcase pendant, E. C. Fitch ..... 539,255
Water lift, centrifugal, S. D. Smith ..... 539,239
Water supply regulator, W. Busch ..... 539,117
Whiffletree coupling clip, J. H. Osborne ..... 539,292
Window, R. Fritz ..... 539,126
Window cleaner, Thierry & Schoenfeld ..... 539,313
Wire, fence, M. F. McNelly ..... 539,390
Wool fat and products resulting therefrom, refining, E. Maertens ..... 539,388
Wool fat and products thereof, treating, Hartsborne & Maertens ..... 539,386
Wrench. See Pipe wrench. Screw wrench.

## DESIGNS.

Bedstead, O. E. A. Wiessner ..... 24,302
Button, T. Greenwald ..... 24,299
Carpet, F. M. Parker ..... 24,303 to 24,305
Cigar clipper base, M. T. Moore ..... 24,309
Cigar wrapper, P. C. Fulweiler ..... 24,308
Cushion, vehicle, R. C. Schemmel ..... 24,307
Engine casing, R. B. Hain ..... 24,318
Feed cutter frame, J. J. Gromme ..... 24,317
Fuel, lump of, W. P. Taggart ..... 24,313
Lock case, H. H. Dent ..... 24,310, 24,311
Metal ware stock, A. R. Pritchard ..... 24,316
Paper weight, E. L. Clark ..... 24,300
Rocking chair, F. P. Hardell ..... 24,301
Sleigh running gear, A. E. Perren ..... 24,315
Spoon, A. P. Brown ..... 24,297
Spoon, fork, etc., S. Smith ..... 24,298
Step pad, H. C. Swan ..... 24,306
Stove, oil, R. Z. Liddle ..... 24,312
Whiffletree, R. E. Gregory ..... 24,314

## TRADE MARKS.

Baking powder, W. B. Wilhelm & Company ..... 26,555
Bathtubs and sinks, Standard Manufacturing Company ..... 26,561
Biscuits, crackers, wafers, cakes, and like articles, New York Biscuit Company ..... 26,553, 26,554
Books and photograph albums, blank, Liebenroth, Von Auw & Company ..... 26,532
Bread, baked, Heissler & Junge Company ..... 26,552
Calfskins, patent leather and waxed calf, Doerr & Reinhart ..... 26,537
Canned and bottled goods, certain named, Abraham & Straus ..... 26,550
Canned tomatoes, C. Cole ..... 26,551
Cocktails, preparation for mixed drinks known as, H. Coben ..... 26,546
Cologne, W. P. Ward ..... 26,538
Color for confectioners' use, H. Kohnstamm & Company ..... 26,549
Corsets, Roth & Goldschmidt ..... 26,533
Cosmetics, lotions, perfumery, cream, and soap, Firm of W. Rieger ..... 26,539
Cotton, woolen, and silk fabrics, Burton Brothers & Company ..... 26,535
Flour, wheat, J. B. M. Keblor ..... 26,556
Gum, chewing, V. Silverman ..... 26,547
Harness bames, Platt & Letchworth ..... 26,536
Insects, compounds for destroying, G. A. Houseman ..... 26,540
Matches, Continental Match Company ..... 26,557, 26,558
Matches, friction or parlor, R. L. Brownfield ..... 26,559
Medical preparations, certain, E. L. Andrews ..... 26,541
Medicated extract of beef, H. K. Wampole & Company ..... 26,545
Medicine, certain named, F. S. Humphrey ..... 26,542
Oil or dressing, confectioners', Niagara Oil Company ..... 26,548
Overalls, men's, H. W. Carter & Sons ..... 26,534
Plows, Deere & Company ..... 26,562
Remedy for constipation, J. R. Simpson ..... 26,543
Remedy for women's diseases, Avery Medicine Company ..... 26,544
Stoves, gas and oil, Luther & Lederhos ..... 26,560

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

© 1895 SCIENTIFIC AMERICAN, INC

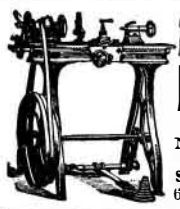
## Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

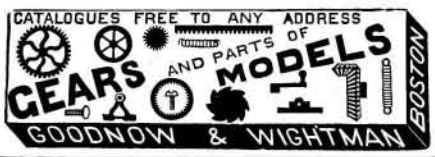
☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



**Star Lathes**
Foot Power
Screw cutting
Automatic
Cross Feed
9 and 12 inch Swing.
New Designs. Novel Features.
*Send for Catalogue* B.
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.

**LATHES,** Shapers, Planers, Drills, Machine Shop Outfits, Foot Lathes, Tools and Supplies. Catalogue Free. SEBASTIAN LATHE CO., 120 CULVERT ST., CINCINNATI, O.




THE SIMPLON TUNNEL.—DESCRIPTION of the project for a tunnel through the Pennine Alps under Monte Leone, which, when completed, will be the longest in the world. Nature of the rock to be traversed, proposed system of construction, ventilation and cooling, hygienic arrangements, outside erections. Full details, with 11 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **998, 999,** and **1000.** Price 10 cents each. To be had at this office and from all newsdealers.

**VANDUZEN STEAM JET PUMP**
THE BEST IN THE WORLD.
*Pumps Any Kind of Liquid.*
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE E. W. VANDUZEN CO.,
102 to 108 E. Second St., Cincinnati, O.

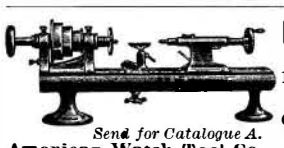
**TO INVENTORS AND PROMOTERS.**

We have had for many years as a specialty the manufacture of some of the most intricate and successful machines, tools and models. Our facilities and equipment, mechanical skill and experience are at your service in bringing to commercial success inventions and improvements in machines or appliances. Satisfaction guaranteed. Contract or day work. For particulars, address THE SIGOURNEY TOOL CO., Hartford, Ct., U. S. A.

IMPROVED COMBINATION
**DIVIDER AND CALIPER.**
Can be used as a Divider, a Hermaphrodite, Keyhole, Inside and Outside Caliper.
By mail, postpaid,
4 inch.....$2.00 | 8 inch.....$2.50
6 " ..... 2.25 | 10 " ..... 2.75
**Mechanics' Fine Tools of all kinds.**
☞ *Send for Illustrated Catalogue B.*
**Standard Tool Co., - Athol, Mass.**

**BUY TELEPHONES**

That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are BOTH GOOD.
WESTERN TELEPHONE CONSTRUCTION CO.,
440 Monadnock Block, CHICAGO.
*Largest Manufacturers of Telephones in the United States*



**MACHINISTS' LATHE.**
Latest Improvements
New Styles.
New Prices.
Growing rapidly in favor.
*Send for Catalogue A.*
**American Watch Tool Co., Waltham, Mass.**

FUNDAMENTAL PRINCIPLES OF Business; Their Application in Practice.—A lecture delivered in the Sibley College Course by T. Dunkin Paret. A very interesting presentation of the subject, full of practical suggestions as to the conditions necessary to obtain business and professional success. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **998** and **999.** Price 10 cents each. To be had at this office and from all newsdealers.

KANE'S PENNINGTON HOT AIR ENGINE
Same power as on Motor cycles
MARINE AND STATIONARY
4 HORSE POWER WEIGHS 50 LBS.
STAMPS FOR CATALOGUE
THOS. KANE & CO., CHICAGO, ILL.

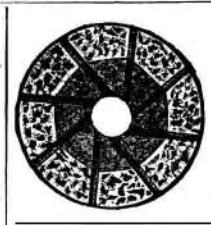
**The Scientific American Reference Book.**

A most useful little bound book of 150 pages, comprising, probably, the most extensive variety of standard, practical, condensed information ever furnished to the public for so small a price, only 25 cents.

Among its contents are: The Last Census of the United States (1890), by States, Territories, and Counties; Table of Cities having over 8,000 inhabitants; Map of the United States—miniature outline; The Patent Laws (full text); The Trade Mark Law (full text); The Copyright Law (full text); The Principal Mechanical Movements—illustrated by 150 small diagrams—of value to inventors and designers of mechanism; Medallion Portraits of Distinguished American Inventors; Valuable Tables relating to Steam, Electricity, Heat, Metals, Weights, and Measures.

☞ *Sent by mail to any address on receipt of price,* **25 cents.**

MUNN & CO., Publishers,
361 Broadway, New York.



**ROCK EMERY MILLSTONES.**
Made of Large Blocks of Emery Set in Metal.
Fastest Grinders known. Can grind anything
NO PICKING.
Made Sharp. Stay Sharp
Will Fit any Mill Frame.
Cheap as Best French Buhrs.
Hundreds in Use for All Purposes.
☞ *Send for Circular.*
Sturtevant Mill Co., Boston, Mass.

**STERLING BICYCLES**
Built like a Watch . . . .
. . . The STRONGEST, LIGHTEST, and FASTEST Bicycles in the World . . . .
*Elegant Catalogue Free on request.*
STERLING CYCLE WORKS,
236-240 Carroll Ave., D 1, CHICAGO.

MEASUREMENT OF POWER.—BY G. D. Hiscox, M.E. A description of several improved forms of absorption and transmitting dynamometers for the measurement of the useful work of prime movers in mills and factories. With 17 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **992.** Price 10 cents. To be had at this office and from all newsdealers.

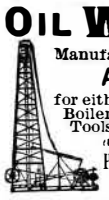
**BARNES Foot-Power MACHINERY.**
CATALOGUE FREE.
FOR WOOD AND METAL WORK.
Machines for Carpenters, Cabinet Makers, Machinists, Electricians, Blacksmiths, Inventors, Manual Training Schools, Model Makers, Bicycle Repairers, Amateur Mechanics.
THE BEST FOOT POWER MACHINES IN THE WORLD.
W. F. & JOHN BARNES CO., 1999 RUBY ST., ROCKFORD, ILL.

**SUPERIOR TO COTTON WASTE**
Endorsed by Fire Underwriters
Safe, durable, cheaper
*Agents wanted*
**RAW SILK MACHINERY WIPERS**
*Beware of loose woven imitations*
AMERICAN SILK MFG. CO.
313 Walnut Street, Philadelphia, Pa.

**WELL DRILLING MACHINERY,**
MANUFACTURED BY
WILLIAMS BROTHERS,
ITHACA, N.Y.
MOUNTED OR ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER
SEND FOR CATALOGUE
ADDRESS WILLIAMS BROS. ITHACA, N.Y.

ARTESIAN WELLS.—BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **943.** Price 10 cents. To be had at this office and from all newsdealers.

**OIL WELL SUPPLY CO.**



Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. *Illus'd catalogue, price lists, and discount sheets on request.*
Pittsburg, Oil City and Bradford, Pa.
Also, 32 Cortlandt St., New York.

**MATCH * MACHINERY.**
Latest improved. Complete plants furnished. JOS. C. DONNELLY, 1209 Buttonwood Street, Philadelphia, Pa.

**Starrett's Universal Surface Gauge**

This gauge has joint at base allowing spindle and scriber to be moved back and forth and placed in any position from upright to horizontal, to reach over, back of, and underneath.
Price, No. 1, 9 inch.....$2.50. No. 2, 12 inch .....$3.00
" No. 3, with two spindles, 12 and 18 inches ..... 3.50
☞ *Illustrated Catalogue Free.*
The L. S. Starrett Co., Manufacturer of Fine Tools, P. O. Box 13, ATHOL, MASS.

**BI-SULPHIDE OF CARBON** for use in the arts, Killing Insects in Grain, Killing Burrowing Animals, etc. Manufactured by E. R. TAYLOR, Cleveland, Ohio

**MODELS & GEARS**
UNION MODEL WORKS, CHICAGO

**TYPEWRITERS.**
All makes half-price. Rebuilt to equal new. Shipped without deposit to responsible parties in all parts of the world. Unprejudiced advice given. Illust'd cata. free.
TYPEWRITER HEADQUARTERS, 45 Liberty Street, New York, U. S. A.

**The Typewriter EXCHANGE,**
1½ Barclay St., New York
We will save you from 10 to 50 per cent. on Typewriters of all makes.
☞ *Send for catalogue.*

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **59.** Price 10 cents. To be had at this office and from all newsdealers

**If you want the best CHUCKS, buy Westcott's**

Little Giant Double Grip Drill Chucks, Little Giant Drill Chucks Improved, Oneida Drill Chucks, Cutting-off Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Plain Universal Lathe Chucks, Independent Lathe Chucks. Made by
**Westcott Chuck Co., Oneida, N. Y., U. S. A.**
*Ask for catalogue in English, French, Spanish or German.*
FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

**THE HYPNOSCOPE** for physicians, dentists, investigators and students of the occult, proves hypnotization possible in all cases. 236 page book on hypnotism, etc., $2. 100 page pamphlet, 10c. NATIONAL INST., 321 Spring St., S 5., Los Angeles, Cal.

365 DAYS AHEAD OF THEM ALL
APPLY AT ONCE FOR CATALOGUE OR AGENCY FOR
KEATING BICYCLES
SEE THAT CURVE
FACTORY HOLYOKE MASS.

**Parson's Horological Institute.**
**School for Watchmakers**
ENGRAVERS AND JEWELERS.
☞ *Send for Catalogue and References.*
PARSON'S HOROLOGICAL INSTITUTE,
302 Bradley Avenue, PEORIA, ILL.

CLIMAX **BICYCLE WATCH**

**Complete with holder.** American lever watch. Guaranteed an accurate timekeeper in pocket or on bicycle. Stem wind and set, strong nickel case. Holder is the only practical one made. The watch *cannot* get out nor rattle. One second adjusts it in holder. Quickly attachable to any part of the machine. Price $2.50 each, postpaid. ☞ *Send for our Sundry Catalogue.*
Robt. H. Ingersoll & Bro., 65 Cortlandt St., New York

THE NEWSPAPER AND THE ART of Making It.—An address delivered at Cornell University, by Charles A. Dana, editor of the New York Sun. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **995.** Price 10 cents. To be had at this office and from all newsdealers.

**The "Climax" Stereotyper AND Moulding Press Combined,**

for making perfect **Celluloid Stereotypes** to be used in place of metal stereotypes. Also for making **Rubber Stamps.** Should be in use in every printing office. See SCI. AM., Dec. 30, 1893. Send for circular to
THE J. F. W. DORMAN CO.
217 E. German St., Baltimore, Md.
Manufacturers of Rubber Stamps, Vulcanizers, Stereotype Machinery and Supplies.

**Pumping Water by Compressed Air.**

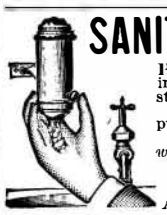
We take pleasure in announcing that by arrangements made with J. G. Pohlé, we are enabled to furnish our customers with the
POHLÉ AIR LIFT PUMP,
protected by numerous American and Foreign patents. This department of our business will be under the personal supervision of Dr. Pohlé, the inventor and patentee.
THE INGERSOLL-SERGEANT DRILL CO.,
Havemeyer Building, 26 Cortlandt St., New York.

**ROCK DRILLS AIR COMPRESSORS &**
GENERAL MACHINERY FOR MINING, TUNNELING, QUARRY & RAILROAD WORK.
RAND DRILL Co 23 PARK PLACE NEW YORK

**How To Make a Dynamo**
OR MOTOR. ¼ horse power size, illustrated with full working drawings. By Edw. Trevert. Price 10c.
Bubier Publishing Co., Lynn, Mass.

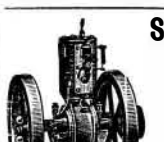
"WOLVERINE"
**GAS & GASOLINE ENGINES**
STATIONARY AND MARINE.
The "Wolverine" is the only reversible marine gas engine on the market. It is the lightest engine for its power. Requires no licensed engineer. Absolutely safe. Manufactured by
WOLVERINE MOTOR WORKS,
12 Huron St., Grand Rapids, Mich.

EXPLOSIVES AND THEIR MODERN Development.—By Prof. Vivian B. Lewes. Four lectures delivered before the London Society of Arts, on the explosive mixtures and compounds of modern times. Gunpowder and the recent improvements in its composition, guncotton, nitroglycerine and nitroglycerine preparations, smokeless powders, explosives for blasting purposes. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **999, 1000, 1001, 1002, 1003** and **1004.** Price 10 cents each or 60 cents for the series. To be had at this office and from all newsdealers.



**SANITARY SOAP VASE**
**PREVENTS** disease, waste, pilfering of soap, clogging of waste pipes, stain of marble, uncleanly soap dish.
**AFFORDS** each user fresh, dry pure soap.
*The Only Clean, Sanitary, and Safe way to use soap.*
*Agents Wanted.*
Sanitary Soap Vase Co.,
Aqueduct Bldg., ROCHESTER, N. Y.

POSSIBILITY OF LIFE IN OTHER Worlds.—A most interesting discussion of this much debated question by the great astronomer, Sir Robert Ball. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **992.** Price 10 cents. To be had at this office and from all newsdealers.



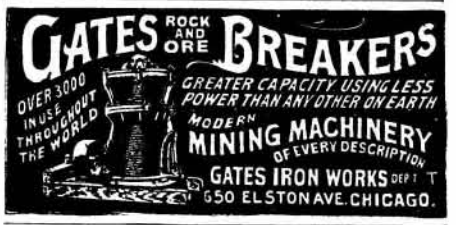
**SINTZ GAS ENGINE CO.**
GRAND RAPIDS, MICH., U. S. A.
Manufacturers of the **Sintz Stationary and Marine Gas and Gasoline Engines.** Especially adapted for Boats and Electric Lighting. Runs with manufactured or natural gas—Boats and launches. Prices within the reach of all. ☞ *Send for Catalogue.*
Mention this paper.

**ELECTRICITY**
Mechanics, Steam Engineering, Mechanical Drawing, Architecture, R. R. and Bridge Engineering, Plumbing, Heating, Mining, English Branches. Send for free circular, stating subject wish to study or your trade.
Correspondence School of Industrial Sciences, SCRANTON, PA.

ACETYLENE. THE COMMERCIAL Synthesis of Illuminating Hydrocarbons.—A paper by Prof. Vivian B. Lewes, read before the London Society of Arts. The production of acetylene from calcic carbide obtained by means of the electric furnace, the light-giving value of this hydrocarbon, its value as a stepping stone to the synthesis of other hydrocarbons, and its commercial possibilities. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **998.** Price 10 cents. To be had at this office and from all newsdealers.

**Towers, Tanks and Tubs**
PATENT SECTIONAL
ALL IRON TOWERS
PLAIN
ALL WOOD TOWERS.
ELEVATED TANKS
for Automatic Fire Sprinkler Plants.
Louisiana Red Cypress Tanks a Specialty.
W. E. CALDWELL CO.,
219 E. Main Street,
LOUISVILLE, KY., U. S. A.

**Experimental & Model Work**
E. V. BAILLARD, 106 Liberty Street, N. Y.

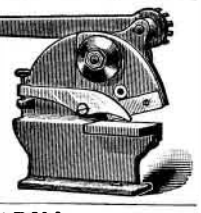

GATES ROCK AND ORE BREAKERS
OVER 3000 IN USE THROUGHOUT THE WORLD
GREATER CAPACITY USING LESS POWER THAN ANY OTHER ON EARTH
MODERN MINING MACHINERY OF EVERY DESCRIPTION
GATES IRON WORKS DEPT T
650 ELSTON AVE. CHICAGO.

**TO BUSINESS MEN**

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page or address MUNN & CO., Publishers.
361 Broadway, New York.

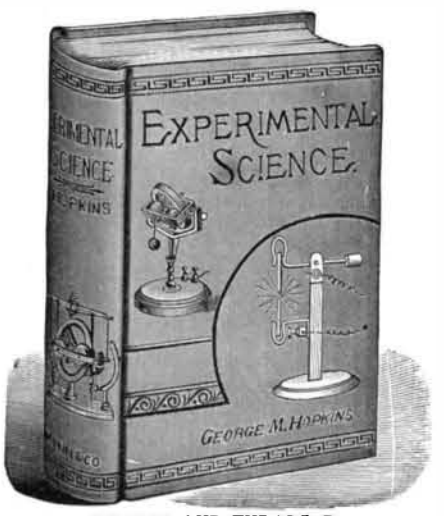
Catalogue Free.
**POWERFUL SHEARS**



Cuts to ¼ inch sheet metal and ⅝ inch rods.
W. W. OLIVER,
Sta. B. Buffalo, N. Y.

NOW READY!

*Fourteenth Edition of*
**Experimental Science**




REVISED AND ENLARGED.
120 Pages and 110 Superb Cuts added.

Just the thing for a holiday present for any man, woman, student, teacher, or anyone interested in science.

In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc.; Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.

840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, $4. Half morocco, $5.
☞ *Send for illustrated circular.*

MUNN & CO., Publishers,
Office of the SCIENTIFIC AMERICAN,
361 BROADWAY, NEW YORK.


© 1895 SCIENTIFIC AMERICAN, INC.

*Founded by Mathew Carey, 1785.*

**HENRY CAREY BAIRD & CO.**

INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS

**810 Walnut St., Philadelphia, Pa., U. S. A.**

☞ Our New and Revised Catalogue of Practical and Scientific Books, 90 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

**CARBORUNDUM**

HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER-CRYSTAL-WHEEL-SLAB & HONE FORM. CARBORUNDUM CO. MONONGAHELA CITY, PA. U.S.A.

**DEER PARK,**

**On the Crest of the Alleghenies.**

To those contemplating a trip to the mountains in search of health and pleasure, Deer Park, on the crest of the Allegheny mountains, 3,000 feet above the sea level, offers such varied attractions as a delightful atmosphere during both day and night, pure water, smooth, winding roads through the mountains and valleys, and the most picturesque scenery in the Allegheny range. The hotel is equipped with all adjuncts conductive to the entertainment, pleasure and comfort of its guests.

The surrounding grounds as well as the hotel, are lighted with electricity. Six miles distant on the same mountain summit, is Oakland, the twin resort of Deer Park, and equally as well equipped for the entertainment and accommodations of its patrons. Both hotels are upon the main line of the Baltimore and Ohio Railroad, have the advantages of its splendid Vestibuled Limited Express trains between the East and West. Season excursion tickets, good for return passage until October 31, will be placed on sale at greatly reduced rates at all principal ticket offices throughout the country. One way tickets, reading from St. Louis, Louisville, Cincinnati, Columbus, Chicago, and any point on the B. & O. system to Washington, Baltimore, Philadelphia or New York, or vice versa, are good to stop off at either Deer Park, Mountain Lake Park, or Oakland, and the time limit will be extended by agents at either resort upon application, to cover the period of the holder's visit.

The season at these popular resorts commences June 22nd.

For full information as to hotel rates, rooms, etc., address George D. DeShields, Manager, Deer Park, or Oakland, Garrett County, Md.

**BUSHNELL'S PERFECT LETTER COPYING BOOKS**

Make perfect copies of letters with ordinary office ink. No press required. Books roll up to make the copy. Indispensable to the traveler and for private use. Sent by mail, postpaid, on receipt of price.
Note size, 6x10 inches....$1.00
Letter size, 10x12 inches, $1.30
Send for circular and agents terms. **Alvah Bushnell,** 403 Chestnut St., Philadelphia, Pa.

**A NEW PIPE WRENCH**

**Grips quickly and firmly, *GALVANIZED* as well as other pipe, *and will not Crush it.* Won't lock on pipe. Does not mar a nut or highly polished fittings. Other features. All dealers.**

☞ *Send for Little Book, Free.*

**SAMUEL HALL'S SON, 229 West 10th St., New York.**

**RACINE BOAT MFG. CO.** RACINE, WIS. U.S.A. DESIGNERS AND BUILDERS. PRICES AND WORK GUARANTEED. SEND 10 CENTS FOR 68 PAGE ILLUSTRATED CATALOGUE M. SAILING YACHTS, LAUNCHES, ROW BOATS, CANOES.

**Is Your Factory Light?**

Asbestine White Cold Water Paint—**Powder form.** Ready for instant use. For Factories, Workshops, Mills, Railroads, Breweries, etc. *Warranted Not to Scale.* Send for small quantity for Trial—**Sent FREE.** GEORGE S. ADAMS, No. 5 Court Sq., Brooklyn, N. Y.

**HELLO, CENTRAL!**

Do you use telephones? If so, we can give you just what you want. Our specialty is Blake Transmitters. There is a "best" in everything, and ours are the best. We supply complete telephones or all or any of the parts to construct a telephone. Write for illustrated catalogue.
PHŒNIX INTERIOR TELEPHONE CO., 131 Liberty St., New York.

**SEND for Catalogue** of the Musical Instrument you think of buying. **Violins repaired** by the Cremona System. C. STORY, 25 Central St., Boston, Mass.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

**SAFETY THRUST COLLARS SOLID AND SPLIT.**
Of character and at price to suit the most critical buyer. Dealers in shafting will consult their interests in writing for Price List and Discounts.
THE GOUVERNEUR MACHINE CO., Gouverneur, N. Y.

**Architectural Books**

**Useful, Beautiful and Cheap.**

Any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION of the SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and persons about to build for themselves will find the work suggestive and most useful. They contain drawings in perspective and in color, together with floor plans, costs, location of residence, etc.

Two volumes are published annually. Volumes 1 to 18, which include all the numbers of this work from commencement to December, 1894, may now be obtained at this office or from Booksellers and Newsdealers. Price, stitched in paper, $2.00 per volume. These volumes contain all the plates, and all the other interesting matter pertaining to the work. They are of great permanent value. Forwarded to any address.

**MUNN & CO., Publishers,**
**361 Broadway, New York.**

**DAIMLER MOTOR COMPANY,**

**BUILDERS OF**

**Highest Grade Single and Twin Screw Launches.**

Safest, cleanest and speediest power boat built. No smoke or smokestack, no boiler, no electricity. No steam or naphtha under pressure. Run on one pint of gasoline per horse power per hour, and are under way in less than one minute. No licensed engineer or pilot.
Also Stationary Motors.

☞ **Send for Illustrated Catalogue and Price List.**

**OFFICE AND WORKS, "STEINWAY," LONG ISLAND CITY, N. Y.**

**TENTS.**

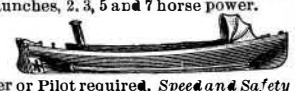
We manufacture Tents of every variety and size, for all conceivable purposes.
We have been in the business for fifty-four years and know how to make them properly.
We have made Tents for the War Department of the U. S. Government for many years.
We are now quoting the lowest prices ever heard of, owing to the low price of cotton canvas.
We solicit your orders, large or small, and will send our Illustrated Catalogue of Tents and Camp Furniture, if you are interested, upon receipt of your address and six cents in stamps.

**GEO. B. CARPENTER & CO.**
202-208 So. Water St., CHICAGO

**PRENTISS TIME SYSTEM**
8, 30, 60, 90 and 100 day movements.
**SYNCHRONIZED CLOCKS**
Synchronizers for Time-Stamps and Recorders. Also Mechanical Self-winding Clocks.
CALENDAR CLOCKS
Tower Clocks, Outside and Synchronized Sign Clocks. *Clocks rented in New York City*
☞ Send for pamphlet and particulars.
**The Prentiss Clock Improvement Co.,**
49 DEY ST., NEW YORK CITY.

CALENDOLI'S TYPESETTING MAchine.—Description of a machine recently invented by Father Calendoli, a Sicilian Dominican, which permits an experienced operator to compose fifty thousand letters an hour. With 7 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1005.** Price 10 cents. To be had at this office and from all newsdealers.

**ALCO VAPOR LAUNCH**
**Engine and Helm Controlled from Bow**
Latest improved and only 12 to 1 Motor now ready for the market. 18 to 40 ft. Launches, 2, 3, 5 and 7 horse power.



No licensed Engineer or Pilot required. *Speed and Safety guaranteed. No Dangerous Naphtha or Gasoline used.*
**Marine Vapor Engine Co., Jersey City, N. J.**

**MONITOR VAPOR ENGINE AND POWER COMPANY,**
8 ERIE STREET, GRAND RAPIDS, MICHIGAN.
CASOLINE LAUNCH ENGINES AND LAUNCHES

**THE ELECTRIC LAUNCH CO.**
OFFICE AND WORKS: 186th STREET
MORRIS HEIGHTS, NEW YORK CITY.

THE AUSTRALIAN PATENTS DEVELOPMENT CO., Melbourne, require AGENTS throughout the world.

MESSRS. MUNN & CO., Solicitors of Patents, have had nearly fifty years' continuous experience. Any one may quickly ascertain, free, whether an invention probably is patentable by writing to Munn & Co. Communications strictly confidential. A handbook of patents and how to obtain them sent free.

**PATENTS**

taken through Munn & Co. receive special notice in the *Scientific American.* This splendid weekly paper, elegantly illustrated, has the largest circulation of any scientific work. $3 a year. Specimen copies free.
Address MUNN & CO., New York, 361 Broadway.

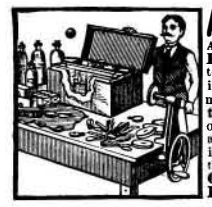
PRICES on Small Motors, Dynamos, and Castings for same, for 2c. stamp. Wm. V. L. Grubb, Columbus, O.

**B. F. ROUNDS** PATENT RUBBER ANKLE ESTAB'D 1879 ARTIFICIAL LIMBS, ETC. 10 W. 9 ST. KANSAS CITY, MO. SEND FOR CIRCULAR

**MADE TO ORDER**

$10 SUIT OR OVERCOAT

Imported cloths—Suits and Overcoats from $10 to $20—the style and material you select. We are direct importers—guarantee perfect fit, superior workmanship and finest trimmings. We pay express charges to any part of the United States. Goods sent C. O. D., with privilege of examination. Write for free catalogue, samples and measuring instructions.
**THE PROGRESS TAILORING CO.**
262 and 264 State St., Dept. 24, Chicago, Ill



**AGENTS** LADIES OR GENTS **$75 A WEEK,** At home, using or selling **Gray Plater,** or collecting goods for us to plate. We do all kinds of plating at our works, manufacture the materials and outfits, and **teach the art.** We sell the only complete outfit, including lathe, wheels, tools and materials for polishing, preparing, plating and finishing everything. Circulars and prices free. **Gray & Co., Plating Works, Dep't 4, Columbus, Ohio.**

DRY BATTERIES.—A PAPER BY L. K. Bohm, treating of open circuit batteries, historical dry batteries, modern dry batteries, Hellesen's battery, Bryan's battery, Koller's battery, and the efficiency of dry cells. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1001.** Price 10 cents. To be had at this office and from all newsdealers.

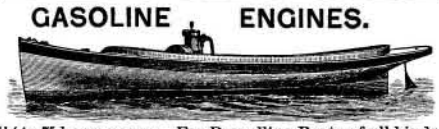
**MACHINE WORK SOLICITED.** Complete equipment Modern Machine Tools. Pattern Making, Designing, Experimental Work. Technical assistance if required. Best facilities, very reasonable prices. P. PRYIBIL, **512-524 West 41st Street, New York.**

**1895 High Grade Bicycles**

Shipped anywhere C.O.D. Saving you dealers profit.
$100 Oakwood' for $62.50
$85 'Arlington' " $45.00
$65 " "$37.50
$20 " "$10.90
Latest models, wood or steel rims; pneumatic tires; weight 17½ to 30 lbs.; all styles and prices. Large illustrated catalogue free.
**Cash Buyers' Union, 162 W. Van Buren St. B 131, Chicago**

**PATENT SALE.** The undersigned will receive bids until June 15, 1895, for Saw File Guide. Letters Patent No. 537,827, issued April 23, 1895. To be opened in public and awarded to the highest bidder. AUG. KAEMPFER, Sheboygan, Wis.

**GASOLINE ENGINES.**



1½ to 75 horse power. For Propelling Boats of all kinds. Cheapest Fuel, Absolute Safety, No Licensed Engineer, Simple Construction, Hundreds in Successful Use.
☞ *Write for illustrated catalogue.*
**GLOBE GAS ENGINE CO.,**
Merion Avenue & 49th Street, PHILADELPHIA, PA.

AMERICAN PATENTS.—AN INTEResting and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002.** Price 10 cents. To be had at this office and from all newsdealers.

**STEEL TYPEWRITER TYPE**
TYPE WHEELS. MODELS & EXPERIMENTAL WORK. SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST. N.Y.

**$5 HAND BONE, SHELL AND CORN MILLS** for Poultrymen.
Circular and testimonials Free.
**WILSON BROS., Easton, Pa.**

**WORCESTER POLYTECHNIC INSTITUTE,**
**Worcester, Mass.**
*Four years' courses* in Civil, Mechanical, Electrical Engineering and Chemistry. New and extensive laboratories and workshops, thoroughly equipped. Expenses low. For catalogue and information address
T. C. MENDENHALL, President.

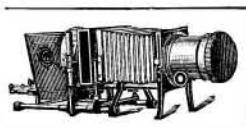
**TELESCOPES** SEND FOR CATALOGUE
W. & D. MOGEY.
BAYONNE CITY, N.J.

SCIENTIFIC AMERICAN DYNAMO. Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75 110-volt incandescent lamps, or of being used as a 5 h. p motor. This machine was constructed especially for the benefit of the readers of the *Scientific American,* by Mr. W. S. Bishop, of New Haven, Conn. It is designed to meet the wants of mechanics and amateurs who desire to construct a simple dynamo for their own use, but who do not care to enter into the subject scientifically. With 24 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **865.** Price 10 cents. To be had at this office and from all newsdealers.

**WELL DRESSED MEN**
wear only merchant tailor made clothes.

**A Tailor-Made Suit For $10.00**

We'll make to your measure a Frock or Sack Suit of
**ALL WOOL GOODS**
equal to any tailors $18.00 garment for $10.00. Other Suits and Trousers just as cheap. We save 50 per cent by buying big lots of woolens direct from the mills—that accounts for it.
All goods sent C. O. D. with privilege of examination before paying express agent. **We pay express charges.**
Send for samples of cloth and full particulars, free.
**LOUIS X VEHON, Tailor, 323 Dearborn St., Chicago.**



**CRITERION MAGIC LANTERNS** And Stereopticons.
Oil, Lime or Electric Light. Front of Lanterns easily removable for substitution of scientific attachments. We make lanterns and views for all kinds of uses.
☞ *Catalogues free.* **J. B. COLT & CO.,** 115 & 117 Nassau Street, New York. 189 La Salle St., Chicago. 50 Bromfield St., Boston. 131 Post St., San Francisco.

**PUMPS** FOR COMPRESSING OXYGEN & HYDROGEN GASES INTO CYLINDERS BY HAND POWER. PRICE $15.00 SEND FOR CATALOGUE No 2 TO CHAS. BESELER, 218 CENTRE ST. NEW YORK.

THE INQUISITION IN MEXICO.—A most interesting historical paper, being a narrative of the experiences of Miles Phillips, one of the members of a trading and discovery expedition to Africa and America fitted out in England in 1567, and placed under the command of Master John Hawkius. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **1004, 1005** and **1006.** Price 10 cents each. To be had at this office and from all newsdealers.

**HELLO!**
**Our New 50c. Telephone**
Entirely new and original. The receivers of this Outfit are so constructed that they have extraordinary acoustic properties. A whisper may be plainly heard at 500 ft. No battery required. Receivers are imitation hard rubber, the pancia form as used on regular instruments. For inside and all short lines this is better than a $100 Outfit. Complete for both ends with all accessories and instructions for using. Sent by express on receipt of 50c. or by mail for 12c. extra.
**R. H. INGERSOLL & BRO. 65 CORTLANDT ST. N. Y. CITY.**

**A. W. FABER**
**Manufactory Established 1761.**
LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS.
**78 Reade Street, - - - New York, N. Y.**
**Manufactory Established 1761.**

**MANVEL WIND MILLS**

with Ball bearing turntable. **Galvanized Steel Mills and Towers.** Your address calls for half-tone engravings.
**WILLIAMS MFG. CO.**
**Kalamazoo, Mich.**
16 Murray St., New York.
36 So. Market St., - Boston.

**ICE MACHINES.** Corliss Engines. Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

**CLAY & TORBENSEN,** GLOUCESTER CITY, N.J.
DESIGNERS & BUILDERS OF YACHTS, LAUNCHES AND HOUSE BOATS.
SEND 8 CENTS FOR CATALOGUE.

**WANTED.** To purchase a Model Railway Mail or Baggage Car. Scale about ¾ or 1 inch to the foot. State price and send description or photograph to FLEMING MAIL CATCHER AND DELIVERER CO., ERIE, PA.

**AMATEUR PHOTOGRAPHERS** Say That **The Best Blue Print Paper** Is Our **FRENCH SATIN JUNIOR.**

4x5 per Gross, $1.00
5x8 " " 2.00
Does all that silver paper will. Unsurpassed for beautiful definition. Keeping qualities guaranteed for one year. Money returned if not satisfactory. ☞ *New Book on Blue Printing, Sample, and Price List sent Free.*
J. C. MILLEN, 923 Arch Street, PHILADELPHIA, PA.

**A Valuable Book**

**12,500 Receipts. 708 Pages. Price $5.**
*Bound in Sheep,* **$6.** *Half-Morocco,* **$6.50.**

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

**Over Twelve Thousand** selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

☞ *Send for Descriptive Circular.*

**MUNN & CO., Publishers,**
**SCIENTIFIC AMERICAN OFFICE,**
**361 Broadway, New York.**

© 1895 SCIENTIFIC AMERICAN, INC.

## Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

---

**NEW - MAIL**

Highest Possible Grade.

Price for 1895, - - $85

*Men's and Ladies' Patterns.*

Boys' and Girls' Wheels, $15, $20, $40, etc.

**Wm. Read & Sons, 107 Washington St., Boston**

---

MANUFACTURE OF BICYCLES.—A very comprehensive article giving the details of construction of every part of these vehicles. With 15 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 908. Price 10 cents. To be had at this office and from all newsdealers.

---

BICYCLE CHAIN CO. P. O. Box 1563, New York City.

---

**$18** buys a beautiful little Canoe; or a Magnificent Pleasure Boat for **$125**
☞ *Send for 60-page illus. catalog.*
J. H. RUSHTON, CANTON, N. Y.

---

**ACCOUNTANTS**
**who use the Comptometer**
have no trouble with their trial balance. Has it ever occurred to you that by getting one you might save lots of time, avoid mistakes and not ruin your nerves?
*Write for Pamphlet.*
FELT & TARRANT MFG CO.
52-56 ILLINOIS ST., CHICAGO.

---

**At 1/4 Price** Bicycles, Watches, Guns, Buggies, Harness, Sewing Machines, Organs, Pianos, Safes, Tools, Scales of all varieties and 1000 other articles. Lists free. CHICAGO SCALE CO., Chicago, Ill.

---

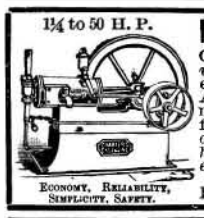
**They All Like It.**
**The Ladies Like It.**
**So Do The Men.**
**Children Enjoy It.**

Layman Pneumatic Boats.

Place your order in time to be filled for this season.
Free—*Our Descriptive Catalogue and Price List.*
Address H. D. LAYMAN,
851 Broadway, New York.

---

1¼ to 50 H. P.




**Motor of 19th Century**
Can be used *any place*, to do *any work*, and by *any one*. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. *Cost of operation about one cent an hour to each indicated horse power.* For circulars, etc., address
Charter Gas Engine Co.
P. O. Box 148, Sterling, Ill.

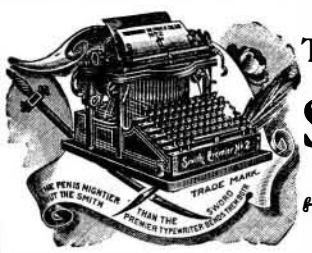
---

**The American Bell Telephone Company,**

125 Milk Street,
Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.

---




"IMPROVEMENT THE ORDER OF THE AGE."

**Three New Model**
**Smith Premier Typewriters**
**NOS. 2, 3 AND 4**

*HAVE YOU EXAMINED THEM?*

Many Improvements Heretofore Overlooked by Other Manufacturers.

Address THE SMITH PREMIER TYPEWRITER COMPANY, Syracuse, N. Y., U. S. A.

BRANCH OFFICES IN TWENTY-NINE PRINCIPAL CITIES IN THE UNITED STATES.

---

The Monarch $85 AND $100
**King of All Roads**

FIVE MODELS—LADIES' AND MEN'S.
Weights, 18 to 25 pounds.
40 Page Catalogue sent for postage.

**RIDE A MONARCH AND KEEP IN FRONT**

**MONARCH CYCLE CO.**
CHICAGO, U. S. A.
BRANCHES: New York, Memphis, Detroit, Denver, Salt Lake City, San Francisco, Portland, Toronto

---

**KODAKS** $6.00 to $100.00.

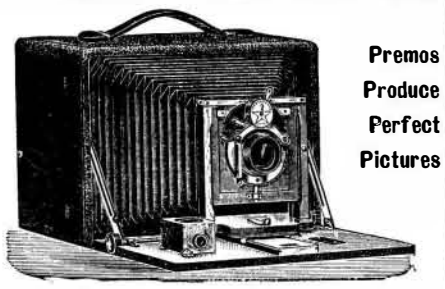
The lightest and most practical cameras for hand or tripod use. An illustrated manual, free with every Kodak, tells how to develop and print the pictures.

**Eastman Kodak Company,**
*Send for Catalogue.* Rochester, N. Y.

---

---

**Premo Cameras**



Premos Produce Perfect Pictures

Are perfect in construction, workmanship and finish, and contain more modern improvements than any other Camera. We make several styles and guarantee them all

ROCHESTER OPTICAL CO.
22 SOUTH STREET, ROCHESTER, N. Y.

---

**PRIESTMAN SAFETY OIL ENGINE**
"*Phenomenally low in cost of operation.*"—Franklin Inst.
NEITHER STEAM NOR ENGINEER
Kerosene, NOT Gasoline

Economical, Simple, Safe, Automatic. For Electric Lighting, Pumping, Milling, etc.
PRIESTMAN & COMPANY, Inc.
Front and Tasker Streets, - - Philadelphia

---

THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers.

---

**Waverley Bicycles**

Are Warranted the Highest of all High-Grade Machines Built in the World, Regardless of Price.

☞ *Catalogue Free.*

Our facilities are the Best in the World for the Production of the Finest Possible Results. Every Machine Fully Guaranteed.

21 lb. Scorcher, - - - - $85.00
Ladies' 22 lb., - - - - 75.00

**INDIANA BICYCLE CO., INDIANAPOLIS, IND., U. S. A.**

---

BRISTOL'S **Recording Instruments.**

Pressure Gauges, Vacuum Gauges, Voltmeters, Amperemeters, Wattmeters, and Thermometers, make continuous records *Day and Night*. Will pay for themselves. Every instrument fully guaranteed and sent on 30 days' trial. ☞ *Send for Circulars and Specimen Chart.*
The Bristol Company, Waterbury, Conn.

---

AGENTS WANTED WRITE FOR CATALOGUE AND AGENCY. FOR FINE TOOLS IN EVERY SHOP. **C. H. BESLY & CO.** CHICAGO, ILL. U.S.A.

---

THE **BACHELDER ADJUSTABLE SPRING INDICATOR.**

**Always ready for use at any speed or pressure.**
This instrument received a special diploma at the World's Exposition, Chicago, 1893, for **Convenience, Mechanical Construction, and Accuracy under all pressure.** ☞ *Catalogue B sent upon application*
THOMPSON & BUSHNELL CO., 112 Liberty St., New York

---

**STEEL CASTINGS** From 1 to 40,000 Pounds Weight of Open Hearth, Chester or Bessemer Steel, *True to Pattern. Sound. Solid.*
GEARING OF ALL KINDS, CRANK SHAFTS, KNUCKLES FOR CAR COUPLERS.
Cross-Heads, Rockers, Piston-Heads, etc., for Locomotives. *Steel Castings of every description.*
CHESTER STEEL CASTINGS CO.
Works, Chester, Pa. Office, 409 Library St., Phila., Pa.

---

DO YOU **USE GRINDSTONES?**
If so, we can supply you. All sizes mounted and unmounted, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. ☞ *Ask for catalogue.*
The CLEVELAND STONE CO.
2d Floor, Wilshire, Cleveland, O.

---

**JESSOP'S STEEL** THE VERY BEST FOR TOOLS, SAWS ETC.
WM JESSOP & SONS LD 91 JOHN ST. NEW YORK

---

**Scientific Book Catalogue**

RECENTLY PUBLISHED.

Our New Catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.
MUNN & CO., *Publishers* SCIENTIFIC AMERICAN,
361 Broadway, New York.

---

**Split Die & Tap Holders** for holding Machine Screw Taps and Dies used in Bicycle Plates.

Four assortments for each holder, holding up to and including 14 sizes.
☞ *Send for fully illustrated catalogue.*
WELLS BROS. & CO., P. O. Box B, Greenfield, Mass.

---

---

**DO YOU WANT A LAUNCH?**

That you can run yourself.
That is Clean and Safe.

That requires neither Licensed Engineer nor Pilot.

Send 10 cent stamp for Illustrated Catalogue of . . . . . .

**THE ONLY NAPHTHA LAUNCH.**

GAS ENGINE AND POWER COMPANY, 185th St., Morris Heights, New York City.

---

**ENGINES,** Boilers and Machine Tools. New and Second-hand. *Send stamp for paper "Machinery & Supplies."* W. P. Davis, Rochester, N. Y.

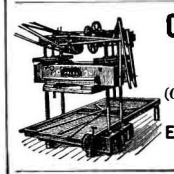
---

**EMERY,** Emery Wheels, Grinding Machines and Grinders' Supplies. Quick process and large stock. When in a hurry, buy of THE TANITE CO., NEW YORK CITY, CINCINNATI, and STROUDSBURG, PA.

---

**MODEL & EXPERIMENTAL WORK**
S. P. DENISON, 143 Center St., New York.

---



**CIDER & WINE PRESS MACHINERY.**
POWER AND HAND PRESSES.
(*Capacity, 10 to 120 Bbls. in ten hours.*)
Send for 50-page Catalogue.
Empire State Pulley and Press Co.
FULTON, OSWEGO CO., N. Y.

---

**PUZZLE PENKNIFE, 10c.**

Best steel Blade concealed in nickel handle. Press the button and it opens. Worth 25c. as a knife and $5.00 as a puzzle. A sample of our 1000 Bargains, mailed postpaid with Cat. for 10c.
ROBT. H. INGERSOLL & BRO, 65 CORTLANDT ST., N. Y. CITY.

---

-- THE --

☞ **ESTABLISHED 1845.**

**The Most Popular Scientific Paper in the World**

**Only $3.00 a Year, Including Postage.**

**Weekly--52 Numbers a Year.**

**This widely circulated** and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

**Terms of Subscription.**—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **Three Dollars** by the publishers; six months, $1.50; three months, $1.00.

**Clubs.**—Special rates for several names, and to Postmasters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to
**MUNN & CO., 361 Broadway, New York.**

---

**Scientific American Supplement**

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

*The most important Engineering Works*, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,
**MUNN & CO., 361 Broadway, New York.**

---

**Building Edition.**

THE SCIENTIFIC AMERICAN BUILDING EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates* and other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to
**MUNN & CO., 361 Broadway, New York.**

---

**Export Edition**

of the SCIENTIFIC AMERICAN, with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN is published monthly, and is uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places *throughout the world*. $3.00 a year, postpaid, to any part of the world. Single copies, 25 cents.

☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost. Rates upon application.
**MUNN & CO., Publishers,**
**361 Broadway, New York.**

---

**PRINTING INKS.**

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1895 SCIENTIFIC AMERICAN, INC.